Facility Investigation Report RCRA §3013 Administrative Order

EPA ID No. OHD. 000 724 138 RCRA Docket No. R3013-5-00-001

Morton International, Inc. Facility Reading, Ohio

Prepared for:

The Rohm and Haas Co.

Bristol, Pennsylvania

June 2002

Project No. 7168

TABLE OF CONTENTS

1.0 I	NTR	ODUCTION	1
2.0 E	BACI	GROUND INFORMATION	2
2.1	SET	TING	2
2.2	SUR	FACE WATER HYDROLOGY	3
2.3	REC	GIONAL GEOLOGY AND HYDROGEOLOGY	5
2.4	Sus	PECTED SOURCE AREAS	6
2.	4.1	On-Site	6
2.	4.2	Off-Site	7
	2.4.	2.1 The Pristine Superfund Site	7
	2.4.	2.2 Cincinnati Drum Facility	11
	2.4.	2.3 Undifferentiated Sources of Impact North Along Mill Creek	12
	2.4.	2.4 City of Reading	12
3.0 P	URP	OSE AND OBJECTIVES OF THE INVESTIGATION	14
4.0 N	AET]	HODS OF THE INVESTIGATION	16
4.1	Soi	L Borings	17
4.	1.1	Rotasonic Drilling	18
4.	1.2	Direct Push Technique	18
4.2	Mo	NITORING WELL INSTALLATION AND DEVELOPMENT	21
4.3	GEO	OPHYSICAL EVALUATION	23
4.4	MIL	l Creek Reconnaissances	24
4.5	Soi	L SAMPLING	25
4.6	Gro	OUNDWATER SAMPLING	27
4.7	SEE	P AND SEDIMENT SAMPLING	29
4.8	SAN	MPLE ANALYSIS	32
4.	8.1	Soil Analysis	33
4.	8.2	Groundwater Analysis	34
4.	8.3	Seep and Sediment Analysis	35
4.9	Gro	OUNDWATER ELEVATION MEASUREMENTS	35

4.	.10	Αqι	JIFER TESTING	35
	4.1	0.1	Step-Drawdown Testing	36
	4.1	0.2	Aquifer Response to Water Recovery Well Operation	38
4	.11	Сом	abined Sewer System Investigation	39
4	.12	Eco	logical Reconnaissance	40
4	.13	Moi	NITORING WELL PLUGGING AND ABANDONMENT	41
4	.14	Sur	VEYING	42
5.0	FJ	INDI	INGS OF INVESTIGATION	43
5	.1	SITE	HYDROGEOLOGY	43
	5.1	.1	Upper Aquifer	43
	5.1	.2	Lower Aquifer	47
5	.2	Сна	RACTERIZATION OF MILL CREEK	48
5	.3	Сне	MICAL IMPACT TO ENVIRONMENTAL MEDIA	49
	5.3	.1	Soils	50
	5.3	5.2	Groundwater	52
	5.3	3.3	Surface Water	59
	5.3	3.4	Sediment	60
5	.4	Sum	MARY OF BASELINE RISK ASSESSMENT FINDINGS	61
	5.4	.1	Human Health Risk	62
	5.4	1.2	Ecological Risk	63
5	.5	PHY	SICAL CHARACTER OF SITE SOILS	63
5	.6	Сна	ARACTER OF SUSPECTED SOURCE AREAS	64
	5.6	5.1	Former Impoundments & Drum Storage Area – SWMUs 1 and 3	64
	5.6	5.2	Former Wastewater Storage and Treatment Tanks (SWMUs 2 & 5 and The	ree
			Additional Non-SWMU Tanks)	64
	5.6	5.3	Former Swale Area – SWMU 10	65
	5.6	5.4	Suspected Waste Burial Areas	65

5.0	6.5 Combined Sewer System – SWMU 12	66
5.7	SOIL BACKGROUND EVALUATION	67
5.8	EVALUATION OF FRENCH DRAIN AND SLURRY WALL INTERIM MEASURES	68
6.0 C	COMPLETION OF INVESTIGATION OBJECTIVES	69
6.1	Investigation-Specific Objectives	69
6.2	QUALITY ASSURANCE OBJECTIVES	75
7.0 C	CONCLUSIONS	77
8.0 B	SIBLIOGRAPHY	80

MORTON INTERNATIONAL, INC.
READING, OHIO
FACILITY INVESTIGATION REPORT
REVISION: 00, JUNE 2002
Page iv of ix

TABLE OF CONTENTS (Continued)

LIST OF TABLES

2-1	Summary of Waste Management Areas
4-1	Summary of Monitoring Well Construction
4-2	List of Soil Samples and Target Analyte Lists
4-3	List of Groundwater Samples and Target Analyte Lists
4-4	List of Sediment and Seep Samples and Target Analyte Lists
5-1	Summary of Groundwater Elevations
5-2	Summary of Volatile Organic Chemical Detections in Soil and Sediment Samples
5-3	Summary of Semivolatile Organic Chemical Detections in Soil and Sediment Samples
5-4	Summary of Pesticide and Polychlorinated Biphenyl Detections in Soil and Sediment Samples
5-5	Summary of Inorganic Chemical Detections in Soil and Sediment Samples
5-6	Summary of Volatile Organic Chemical Detections Detected in Groundwater and Seep Samples
5-7	Summary of Semivolatile Organic Chemical Detections in Groundwater and Seep Samples
5-8	Summary of Pesticide and Polychlorinated Biphenyl Detections in Groundwater and Seep Samples
5-9	Summary of Inorganic Chemical Detections in Groundwater and Seep Samples
5-10	Summary of Water Quality Parameter Measurements in Groundwater and Seep Samples
5-11	Summary of Geotechnical Results

LIST OF FIGURES

2-1	Site Location
2-2	Site Vicinity Map
4-1	On-Site Monitoring Well and Soil Sample Location Map
4-2	Seep/Sediment and Background Sample Location
5-1	Groundwater Gradient Map – November 2001
5-2	Groundwater Gradient Map – March 2002
5-3	Cross Section Location Map
5-4	Cross Section A – A'
5-5	Cross Section B – B'
5-6	Cross Section C – C'
5-7	Cross Section D – D'
5-8	Cross Section E – E'
5-9	Cross Section F – F'
5-10	Cross Section G – G'
5-11	Cross Section H – H'
5-12	Cross Section I – I'
5-13	On-Site VOCs Detected in Soil
5-14	On-Site SVOCs Detected in Soil
5-15	On-Site PCBs/Pesticides Detected in Soil
5-16	On-Site Inorganic Compounds Detected in Soil
5-17	VOCs Detected in Groundwater and Seeps
5-18	SVOCs Detected in Groundwater and Seeps
5-19	PCBs/Pesticides Detected in Groundwater and Seeps
5-20	Inorganic Compounds Detected in Groundwater and Seeps
5-21	Off-Site VOCs Detected in Soil and Sediments
5-22	Off-Site SVOCs Detected in Soil and Sediments
5-23	Off-Site PCBs/Pesticides Detected in Soil and Sediments
5-24	Off-Site Inorganics Detected in Soil and Sediments
5-25	Combined Sewer System Investigation

MORTON INTERNATIONAL, INC. READING, OHIO FACILITY INVESTIGATION REPORT **REVISION: 00, JUNE 2002** Page vi of ix

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

Boring Logs and Monitoring Well Completion Diagrams

Appendix A Appendix B Target Analyte Lists
Aquifer Test Results
Quality Assurance/Quality Control Appendix C

Appendix D

ACRONYMS AND ABBREVIATIONS

- μg/l micrograms per liter
- 1,1-DCA 1,1-dichloroethane
- 1,1-DCE 1,1-dichloroethene
- 1,2-DCA 1,2-dichloroethane
- 1,2-DCB 1,2-dichlorobenzene
- AADD Annual Average Daily Dose
- AO Administrative Order
- App. IX-TAL Appendix IX Target Analyte List
- bgs below ground surface
- BKG-TAL Background Target Analyte List
- BTEX benzene, toluene, ethylbenzene, and xylenes
- CDM Camp Dresser & McKee Inc.
- Cincinnati Drum Cincinnati Drum Service
- CLP-TAL Contract Laboratory Program Target Analyte List
- Conestoga-Rovers Conestoga-Rovers & Associates
- CSOs Combined Sewer Outfalls
- CSS Combined Sewer System
- DPT direct push technique
- E&E Ecology and Environment, Inc.
- EM61 the Geonics EM61 time domain electromagnetic metal detector, a type of electromagnetic survey instrument
- EM31 the Geonics EM31 terrain conductivity meter, a type of electromagnetic survey instrument
- FI Facility Investigation
- ft/day feet per day
- ft/ft feet per foot

ACRONYMS AND ABBREVIATIONS (Continued)

- Geomatrix Geomatrix Consultants, Inc.
- K hydraulic conductivity
- LAW Lower Aquifer Well
- mg/kg milligrams per kilogram
- Morton Morton International, Inc.
- MSD Metropolitan Sewer District
- NPDES National Pollution Discharge Elimination System
- NPL National Priorities List
- OEPA Ohio Environmental Protection Agency
- PAHs polycyclic aromatic hydrocarbons
- PCBs polychlorinated biphenyls
- PCE tetrachloroethene
- PID photoionization detector
- PRC PRC Environmental Management, Inc.
- Pristine the Pristine Superfund Site
- PRP Potentially Responsible Party
- PVC polyvinyl chloride
- QA/QC quality assurance/quality control
- QAPP Quality Assurance Project Plan
- RCRA Resource Conservation and Recovery Act
- RFA RCRA Facility Assessment
- RFI RCRA Facility Investigation
- Rohm and Haas Rohm and Haas Co.
- SERA Screening-Level Ecological Risk Assessment
- SS-TAL Sediment Target Analyte List

ACRONYMS AND ABBREVIATIONS (Continued)

- STL Severn Trent Laboratories
- SVOCs Semivolatile Organic Compounds
- SWMUs Solid Waste Management Units
- T transmissivity
- TCA 1,1,1-trichloroethane
- TCE trichloroethene
- TDS Total Dissolved Solids
- TechLaw TechLaw, Inc.
- TSS Total Suspended Solids
- UA Upper Aquifer
- UAW Upper Aquifer Well
- USCS Unified Soil Classification System
- USEPA U.S. Environmental Protection Agency
- VOCs Volatile Organic Compounds

APPENDIX A

BORING LOGS AND MONITORING WELL COMPLETION DIAGRAMS

SAMPLE COLUMN SYMBOL KEY



SAMPLE RECOVERED



NO RECOVERY



SAMPLE INTERVAL WITH SAMPLE IDENTIFICATION NUMBER SUBMITTED TO LABORATORY FOR GEOCHEMCIAL OR GEOTECHNICAL ANALYSIS

PROJECT:	Morton	Reading FI	Log of Boring No. STR01					
BORING LOC	CATION:	W. of Bldg. 4	0, S. of Trailer		ON AND E			
DRILLING CO	ONTRACTO	R: Bowser	Morner		STARTED: DATE FINISHED:			HED:
DRILLING MI	ETHOD:	Rotasonic			EPTH (ft.)	:	MEASURING POINT: Ground Surface	
DRILLING EC	QUIPMENT:	8" Diamet	er Outer/ 4" Diameter Inner Casing	DEPTH T WATER	O F	IRST	COMPL.	24 HRS.
SAMPLING N	METHOD:	10' Sample	Barrel	LOGGED E. Man			1	
HAMMER WI	EIGHT:	NA	DROP: NA	RESPON		OFESSION	AL:	REG. NO.
DEPTH (feet) Sample Somble Som	Sample Blows/ Sample Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. density, stru cementation, react. w/HCl, geo. inter.			PID READING (ppm)	RE	MARKS
, o	ω m	Asphalt and ro	Surface Elevation: 557.26 ft. (MS	L)		<u>«</u>	~~~	
-		Sub base - gra						
1-					1-			
2-								
- 10		CLAYEY SAN	ID (SC): Very dark brown (10YR 2/2), mois	st, ~60% fine	-			
30801001		to medium sa	nd, ~40% medium to high plastic fines					
4-	V							
_	$ \Lambda $							
5-						1.1		
_								
6-								
7-			ADED SAND WITH GRAVEL (SP): Yellow ry to moist, ~80% medium sand, ~20% gra					
_		trace fines				0.7		
8-								
_			ID (CC), have a (40VD 5/2), resist. COV/ 5		-			
9-		~40% medium	ID (SC): brown (10YR 5/3), moist, ~60% fin plastic fines	ne sanu,				
10-	\triangle							
_			(ML): brown (10YR 5/2), moist, ~100% lo					
11-		plastic fines, f discoloration (irm, massive, laminated, iron-colored (hori loess?)	zontal)	1-			
_								
POORLY GRADED SAND (SP): brown (10YR 5/2), dry, ~90% medium to fine sand, ~5% fine gravel, ~5% fines						650		
						000		
14								RMR K3
	1	Geon	natrix Consultants		Project N	No. 7168	F	Page 1 of 8

Morton Reading FI PROJECT: Log of Boring No. STR01 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 030801004 15 590 Increasing gravel with depth 16 80 17 18 19 20 20.5 - 21.25': Black discoloration, chemical odor observed, moist gravel lense at 21.25' 200 21 SANDY LEAN CLAY (CL) [TILL]: olive brown (2.5Y 4/3), dry, hard, ~90% high to medium plastic fines, ~10% medium sand, trace fine 22 gravel, massive (no structure), hard 23 24 Soft 286 25 Very hard, dark greenish gray (5GY 3/1), abundant medium and fine gravel (mafic angular to subrounded), few iron-colored mottles 26 27 28 030801005 29 30

31

Morton Reading FI PROJECT: Log of Boring No. STR01 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. SANDY LEAN CLAY (CL): continued 32 33 Coarse gravel 34 35 Transition from SANDY LEAN CLAY to POORLY GRADED SAND, multiple clay lenses 36 37 1.5 38 POORLY GRADED SAND (SP): dark greenish gray (10Y 4/1), moist, 95% fine sand, 5% low plastic fines 39 40-SANDY LEAN CLAY (CL): dark greenish gray (5GY 3/1) ~90% high to medium plastic fines, ~10% medium sand, trace fine gravel, massive (no structure), hard 42 43-POORLY GRADED SAND (SP): dark grayish brown (10YR 4/2), moist to wet, ~100% medium grained sand, trace fines, with some gravel 0.9 45 46 46'-47' Coarse sand RMRK3

Project No. 7168

Page 3 of 8

Geomatrix Consultants

PROJECT: Morton Reading FI

Log of Boring No. STR01 (cont'd)

SAMPLES			(5)	
Sample No. Sample Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		PID READING (ppm)	REMARKS
	POORLY GRADED SAND (SP): continued			
-				
19				
- X				
0				
-				
1-		-		
-				
2-		-		
-				
3-				
-		-		
4-	Coarse sand, few gravel, greenish black (10Y 2.5/1)	-		
-				
5-		-		
-	SILT (ML): greenish gray (10Y 5/1), wet, ~100% low plastic fines,			
6-	laminated, soft, roots present	-		
-				
7-		1-1		
-	Laminations: organic silts (OH), black (25Y 2.5/1)			
030901007	Earlinations. Organic sitts (OTT), black (201 2.571)	-	0.6	
3080		-		
9-		-		
-		1-1		
o-	laces and with doubt			
-	Increase sand with depth	-		
1-				
-				
2-	FAT OLAY (OL) adapt are saids area (FO 4/4) are into 4000/ birth			
	FAT CLAY (CL): dark greenish gray (5G 4/1), moist, ~100% high plasticity fines, soft			
3-	D-1 (FV 4/4)			
	Dark gray (5Y 4/1)			
4-	POORLY GRADED SAND (SP): olive gray (5Y 4/2), moist, ~95% coarse sand, ~5% fines, loose			
5				
	××-			RMRK
	Geomatrix Consultants	Project N	No. 7168	Page 4 of 8

PROJECT: Morton Rea		1orton	Reading FI	Log of Borir	g of Boring No. STR01 (cont'd)					
DEPTH (feet)	Sample No.	Sample M	Blows/ S Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	nsity, structure, er.		PID READING (ppm)	F	REMARKS	
_				SILT (ML): dark greenish gray (5GY 4/1), moist plastic fines (more clay than above)	, ~100% medium	-	0.6			
66-				66 - 68' clay content increased						
67 - -										
68- -				~100% low plasticity fines						
69- -				POORLY GRADED SAND (SP): dark greenish ~100% fine sand, trace fines	gray, (10Y 4/1) moist,					
70-				~95% fine sand, 5% fines, wet		_				
71-										
72-										
73- -	030901009			72.5 - 73' black (10YR 2/1), chemical odor, no swetted, grains appear to be stained, black color above underlying clay. No mobile product obse	red soil immediately		2.8			
74-				CLAY (CL): dark greenish gray (10Y 4/1), wet, fines, soft, homogeneous	100% medium plastic					
75- -				75 - 76' silt lens						
76-				White shell fragments (?)						
77-	030901008									
78-										
79-										
80-				Hard, few shells (?)						
81-									·*	
82-									RMRK3	
			/	Geomatrix Consultants	Proje	ct No.	7168		Page 5 of 8	

PROJECT: Morton Reading FI Log of Boring No. STR01 (cont'd) SAMPLES PID READING DEPTH (feet) DESCRIPTION **REMARKS** Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CL): continued 83 84 85 POORLY GRADED SAND (SP): dark greenish gray (10Y 3/1), wet, ~100% fine sand, trace low plastic fines 86 86.5' - 86.75' black, chemical odor, no sheen present when wetted, no 87 mobile product observed 87.75' - 88' black chemical odor, no sheen present when wetted, no 88 3.1 mobile product observed LEAN CLAY (CL): dark greenish gray (10Y 3/1), moist, ~95% high to medium plastic fines, ~5% medium sand, hard, blocky, massive 89 90 91 Piece of fossiliferous limestone 92 93 94 95 96 97 98 POORLY GRADED GRAVEL WITH SAND (GP): olive gray (5Y 5/2), wet, 75% coarse gravel, 20% sand, 5% low plasticity fines 99 RMRK3 //% **Geomatrix Consultants** Project No. 7168 Page 6 of 8

PROJE	CT:	N	lorton F	Reading FI	Log of Bo	Boring No. STR01 (cont'd)					
DEPTH (feet)	Sample No.	Sample N	Blows/ G Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. ir	ensity, structure, tter.		PID READING (ppm)	REMARKS			
_				POORLY GRADED GRAVEL with SAND (GP 1" - 4" subangular - subrounded gravel, fossilit		-	0.6				
100-				POORLY GRADED SAND (SP): light olive bro	own (2.5Y 5/6), wet,						
101-		4									
102-											
103-	-						0.0				
104-											
105-											
106-											
107-				107' - 109' fine sand							
108-											
109-				Medium grained sand		_					
110-				SILTY SAND (SM): light olive brown (2.5Y 5/6 laminations, dark organic odor,), wet, uniform, fine						
111-											
112- -											
113-											
114-	030901012						6.8				
115-											
116-								RMRK			
			17	Geomatrix Consultants		Project N	lo. 7168	Page 7 of 8			

Morton Reading FI PROJECT: Log of Boring No. STR01 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SILTY SAND (SM): continued 117 118 119 120 Total Depth: 119.9 feet below ground surface 121 122 123 124 125-126 127 128 129 130-131 132 133 RMRK3 Project No. 7168 Page 8 of 8 **Geomatrix Consultants**

PROJE	PROJECT: Morton Reading FI				Log of Boring No. STR02							
BORIN	G LOC	CATI	ON:	70' N.W. of C	ircle			LEVATION AND DATUM: 52.08 ft. (MSL)				
DRILLI	NG CO	TNC	RACTO	OR: Bowser	Morner		DATE STA 3/12/01			HED:		
JRILLII	PRILLING METHOD: Rotasonic TOTAL DEPT 89.0							PTH (ft.):	:	3/13/01 MEASURING Ground Su		
DRILLI	DEPTH TO						F	IRST	COMPL.	24 HRS.		
SAMPL	ING N	 ИЕТН	 HOD:	10' Sample I		J	LOGGED E					
HAMMI				NA	DROP: NA			BLE PR	OFESSION	AL:	REG. NO.	
		MPL		IVA	DESCRIPTION		M. Hemir	ngway	(C)		NA	
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	NAME (US	CS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. in:				PID READING (ppm)	RE	MARKS	
	Sar	Sar	의 규		Surface Elevation: 552	2.08 ft. (MSL)			RE)			
				Asphalt				_				
1-	031301025			Road base - gi	ravei D (SC): dark brown (10Y 3/3), m	oist 70% fine	and	-				
_	0313			30% low plasti		0131, 7070 11110 3	sanu,	-				
2-												
_									0.6			
3-												
4-											ì	
4-												
5-					colored mottling				0.6			
_				Same as abov	e, increase sand with depth							
6-				SII TY SAND (SM): dark grayish brown (10Y 4		edium	- -				
_				sand, 10% low		, 2), w et, ee /e /	iculaiii	-				
7-												
									1.6			
8-												
9-									2.0			
_				Increasing gra	vel content (1" - 2") with depth				2.0			
10-												
_												
11-				11 - 13' black s	staining, strong chemical odor							
_	11.5 - 11.75' clay lens											
12-	12 11.75 - 12' gravel - appears to be liquid saturated with black material					nate rial						
	13 - 13								1.6			
SANDY LEAN CLAY (CL): dark olive gray (5Y3/2), wet, 90% medium												
14-				piastic fines, 1	0% medium sand, moist, hard, t	ace gravel						
				⊘ Geom	atrix Consultants			Project N	lo. 7168	F	Page 1 of 6	

Morton Reading FI Log of Boring No. STR02 (cont'd) SAMPLES PID READING DESCRIPTION REMARKS Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 1.6 SANDY LEAN CLAY (CL): continued 15 16 17 0.9 18 19-Same as above 20 0.4 21 031301027 22 0.4 23 24-Becomes softer with increasing silt content with depth 0.4 25 26 27 0.2 28 29 Same as above 0.2 30 31 **Geomatrix Consultants** Project No. 7168 Page 2 of 6

PROJECT:

Log of Boring No. STR02 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION **REMARKS** Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL): continued 32 Decreasing sand content with depth 33 34 35-36 37 38 SILTY SAND (SM): dark gray (2.5Y 4/1), moist to wet, 85% fine and 39 3.0 medium, 15% low plastic fines, sand, trace gravel, sand lens SANDY CLAY (CL): dark greenish gray (10Y 4/1), moist, to wet, 90% 40low plastic fines, 10% fine sand, trace gravel, carbonized wood SANDY SILT (ML): light olive brown (2.5Y 5/4), 60% low plastic fines, 40% fine sand, moist to wet, trace gravel 42 43-0.9 45 46-47 4" layer medium sand 48 RMRK3 11900 **Geomatrix Consultants** Project No. 7168 Page 3 of 6

PROJECT:

Morton Reading FI

PROJECT: Morton Reading FI Log of Boring No. STR02 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. SANDY SILT (SM): continued 3" layer gray clay 49 POORLY GRADED SAND (SP): light olive brown (2.5Y 5/4), wet, 90% fine to medium sand, 10% fines 50 51 52 Silt decreases with depth 53 54 031301028 55 56 57 58 Color change, dark grayish brown (2.5Y 4/2), 1/4" - 1/2" black laminations, trace silt 2.5 59 60 0.0 61 61 - 62.5' 1" - 2" black laminations 62 63 64 RMRK3 Page 4 of 6 **Geomatrix Consultants** Project No. 7168

Morton Reading FI PROJECT: Log of Boring No. STR02 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 66 67 68 69-Same as above 70 71 72 73-74 0.0 75 76 77 78 79 Same as above 80 81 82 RMRK3 /XX **Geomatrix Consultants** Project No. 7168 Page 5 of 6

PROJECT: Morton Reading FI Log of Boring No. STR02 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 83 84 85 86 87 88 89-Total Depth: 89 feet below ground surface 90 91-92 93 94 95 96 97 98 99 RMRK3 Project No. 7168 Page 6 of 6 **Geomatrix Consultants**

PROJECT: Morto	L	Log of Boring No. STR03					
BORING LOCATION:	STR03		EVATION AND DATUM: 54.53 ft. (MSL)				
ORILLING CONTRACT	OR: Bows	ser Morner	DATE STAI 3/14/01)	DATE FINIS 3/19/01	HED:
DRILLING METHOD: Rotasonic TOTAL 69.0):	MEASURING POINT: Ground Surface	
DRILLING EQUIPMENT: 8" Diameter Outer/ 4" Diameter Inner Casing WATER					FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	10' Samp	le Barrel	LOGGED B				
HAMMER WEIGHT:	NA	DROP: NA		BLE PF	ROFESSION	AL:	REG. NO.
(feet) Sample No. Sample Blows/ Foot	NAME (DESCRIPTION USCS): color, moist, % by wt., plast. density, struc cementation, react. w/HCl, geo. inter.			PID READING (ppm)		
- W W m -	Asphalt	Surface Elevation: 554.53 ft. (MSI		α .			
-	Base grave						
1-		AY (CL): greenish black (10Y 2.5/1), dry to m.s, 20% fine sand, hard, strong chemical odor	oist, 80% low		28.1		
2- - 3-				-			
4 4	Black staini	ng at 4' D (SM): greenish black					
5-		SANDY CLAY (CL): black, wet, 70% low plastic fines, 30% fine to					
6-		nd, gravel abundant sand seep, chemical odo		-			
8-				-	12.7		
9 10-	Abundant g	ravel at 9'		-	75.4		
11-		SRADED SAND (SP-SM): black, moist, 90% castic fines, chemical odor, no liquid observed	oarse sand,				
13-01041032	SANDY LE	12 - 12.5' fine gravel lens SANDY LEAN CLAY (CL) [TILL]: olive (5Y 5/4), ~80% medium to high plastic fines, ~20% medium sand and fine gravel			47.0		
14							RMF
	∕⁄∕ © Ge	omatrix Consultants		Project I	No. 7168		Page 1 of 5

PROJECT: Morton Reading FI Log of Boring No. STR03 (cont'd) SAMPLES PID READING DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [TILL]: continued Some black staining, very hard 15 3.7 16 4.0 18 19 Dark greenish gray (10Y 4/1), dry to moist, abundant coarse sand and 2.6 fine gravel, gravel is angular to subround, various lithologies 20 21 22 5.1 23 24 Blocky, siltier than above 5.5 25 26-27 Abundant cobble 28 29 Same as above, cobble at 29' 30 31 RMRK3 /X Page 2 of 5 **Geomatrix Consultants** Project No. 7168

Morton Reading FI PROJECT: Log of Boring No. STR03 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [TILL]: continued 32 33 34 Dark grayish brown (2.5Y 4/2), few gray mottles, increasing sand content, very hard, blocky 35 Sand seam at 35-35.5' 36 1.1 031901034 37 38 39 Same as above, increasing silt content 40 SILT (ML): yellowish brown (10YR 5/4), wet, 95% low plastic fines, 42 5% fine sand, soft, homogeneous 43 44 - 46' clay and gravel present, iron discoloration 0.5 46 47 Black laminations, no odor, weakly bedded 48 RMRK3

Project No. 7168

Page 3 of 5

1/20=

Geomatrix Consultants

PROJECT: Morton Reading FI Log of Boring No. STR03 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION **REMARKS** Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SILT (ML): continued More clay than above, increasing fine sand content, block discoloration at bottom, organics (?) 0.7 49 POORLY GRADED SAND (SP): yellowish brown (10Y 4/4), wet, 95% fine medium sand, 5% low plastic fines, trace gravel (sandstone) 50 51 52 53 54 55 56 57 58 59 59' - 61.5' medium sand 60 61

Fine to medium sand **Geomatrix Consultants** Project No. 7168 Page 4 of 5

62

63

64

65

PROJECT: Morton Reading FI Log of Boring No. STR03 (cont'd) PID | READING | (ppm)_ SAMPLES DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 66-0.5 67-Black material 68 69-Total Depth: 69 feet below ground surface 70-71 72-73 74 75 76 77 78 79 80 81 82 RMRK3 /X **Geomatrix Consultants** Project No. 7168 Page 5 of 5

PROJECT: Morton Reading FI							Log of Boring No. STR04					
BORIN	G LOC	ATI	ON:	N.W. Fence	Main Parking Lot		ELEVATION AND DATUM: 560.27 ft. (MSL)					
DRILLII	NG CC	ITNC	RACTOR	Bowse	er Morner		DATE STARTED: DATE FINISHED: 3/19/01 3/20/01					
DRILLING METHOD: Rotasonic				Rotasonic			TOTAL DE 109.5			MEASURING Ground Sui		
DRILLII	NG EC	UIP	MENT:	8" Diame	ter Outer/ 4" Diameter Inne	r Casing	DEPTH TO WATER		FIRST	COMPL.	24 HRS.	
SAMPL	ING M	1ETH	HOD:	10' Sample	e Barrel		LOGGED I	ell				
НАММ	ER WE	EIGH	IT:	NA	DROP: NA		RESPONSIBLE PROFESSION M. Hemingway			AL:	REG. NO.	
DEPTH (feet)	Sample No.	Sample 7	Blows/ m Foot	NAME (U	DESCRIPTION SCS): color, moist, % by wt., plas cementation, react. w/HCl, geo	st. density, structure, o. inter.			PID READING (ppm)	REN	MARKS	
	Sa	Sa	8 .			560.27 ft. (MSL)			8.			
-				Grass/topsoil	l			-				
1-	9	+		SANDY CLA	Y (SC): brown, moist, clay, sar	nd. gravel. soft		-				
	031901036					, 6		-				
2-	3											
3-									2.9			
_								-				
4-												
_											, 1	
5-									1.0			
_								-				
6-												
7-												
								-	0.5			
8-		$\frac{\perp}{1}$						-				
		\bigvee						-				
9-		$/ \setminus$						-				
10-									1.0			
-								-				
11-								-				
-				POORLY GR	RADED SAND (SP): olive brow	rn (2.5Y 4/4), mois	t, 100%	_ -				
12-					d, trace low plastic fines	, ,		-				
40											-	
13 <i>-</i> -												
14-											RMRK3	
			17	Geo	matrix Consultants			Project	No. 7168	P	age 1 of 7	

Log of Boring No. STR04 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample Sample No. NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 15 16-031901038 17 17 - 17.5' black material, chemical odor 3.3 031901037 8.7 18-19 19.5 - 20.5' black staining, wet, gravel 20 21 21.5' iron discoloration SANDY LEAN CLAY (CL) [TILL]: dark greenish gray (10Y 4/1), moist, 22 hard, ~70% fines, ~30% sand and gravel 031901039 2.0 23 24 2.8 25 26 27 28-29-Same as above, becomes softer with depth, blocky 30 31 /X **Geomatrix Consultants** Page 2 of 7 Project No. 7168

Morton Reading FI

PROJECT:

PROJECT: Morton Reading FI

Log of Boring No. STR04 (cont'd)

SAMPL			ES	DESCRIPTION		<u> </u>	DEMARKS
DEРТН (feet)	Sample No.	Sample	Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		PID READING (ppm)	REMARKS
	0,						
22-							
32-				95% medium plastic fines, 5% medium sand, few cobbles			
33-						2.5	
-							
34-							
~ ^-							
35-				·			
36-							
_			,	<1" fine gravel seam	-		
37-				Timo gravorosam			
				1/2" sand seam			
38-							
39-							
_		-			-		
40-				~6" clayey gravel		0.0	
				4" cobble present			
41-							
42-				Oli T /MI) was a dark area (40VD 2(4) as lable day (400V lavel)			
-				SILT (ML): very dark gray (10YR 3/1), moist to dry, ~100% low to medium plastic fines, trace fine sand, few wood chips, firm, no	-	0.7	
43-				structure apparent			
-			- Constitution				
44 -				LEAN CLAY (CL): dark greenish gray (10YR 4/1), hard, dry to moist, 80% fines, 20% fine sand, trace gravel			
45-				- · · · , · · · · · · · · · · · · · ·			
_							
46-				4" cobble present	-		
47 -							
48-							
				Geomatrix Consultants		N. 7400	RMRK3
				Geomatrix Consultants	Project I	No. 7168	Page 3 of 7

PROJE	CT: Morton	Reading FI	Log of Boring No. STR04 (cont'd)				
DEPTH (feet)	Sample No. Sample Blows/ Sample Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	ensity, structure, ter.		PID READING (ppm)	REMARKS	
_		SILT (ML): dark greenish gray (10Y 4/1), moist fines, weak bedding, homogeneous firm to hard	, ~100% low plastic d (loess?)	-			
49- -							
50-		Same as above			2.0		
51-							
52-							
- 53-							
_ 54 –	032001040						
				_			
55- -							
56 – –		Increasing clay with depth					
57 - -		moredoing oldy with depth					
58-							
59-							
60-		Same as above			1.4		
- 61-							
62-							
63-		Few clay seams 1" - 1 1/4" thick					
64 – –		Weak bedding, slight iron-colored mottling, trac	ce sand, paid dilatency				
65			1			RMRK3	
		Geomatrix Consultants		Project N	lo. 7168	Page 4 of 7	

PROJECT: Morton Reading FI Log of Boring No. STR04 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 66 Increasing sand with depth 67 68 POORLY GRADED SAND (SP): dark yellowish brown (10YR 4/4), 69 wet, ~100% fine sand, trace fines, black laminations 70 Same as above 71 72-1.2 73 74

75 76 77 78 79 1 - 2" gravel with low to medium plastic fines, white mottles (calcium carbonates) SANDY LEAN CLAY (CL) to LEAN CLAY (CL) [TILL]: dark greenish 80 gray (10Y 3/1), ~70% medium plasticity fines, 30% sand and gravel, very hard, no structure 81 82 RMRK3 1180 Page 5 of 7 **Geomatrix Consultants** Project No. 7168

Morton Reading FI PROJECT: Log of Boring No. STR04 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL): to LEAN CLAY (CL): continued 83 84 85 86 87 032001041 88 89 90 91 92 4" gravel lens POORLY GRADED SAND (SP): olive brown (2.5Y 4/4), wet, ~100% 93 fine to medium sand, trace fines 94 95 96 97 98 99 RMRK3 1/80= Page 6 of 7 **Geomatrix Consultants** Project No. 7168

Morton Reading FI PROJECT: Log of Boring No. STR04 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 100 101 102 Greenish gray (10Y 5/1) 103-104 105-106-107 Yellowish brown (10YR 5/6), medium grain 108-109-Total Depth: 109.5 feet below ground surface 110-111 112-113-114 115 116 RMRK3

Geomatrix Consultants

Page 7 of 7

Project No. 7168

PROJE	CT:	٨	/lorton	Reading FI				Log	of Borin	ng No. S	TR05			
BORIN	G LO	CAT	ION:	30' N. of Bld	g. 20		556.80 f							
DRILLII	NG C	TNC	RACTO	DR: Bowse	r Morner		DATE ST/ 3/10/01			DATE FINIS 3/10/01	HED:			
DRILLII	NG M	ETH	OD:	Rotasonic			TOTAL DI 79.5	EPTH (ft	.):	MEASURING Ground S				
DRILLII	NG E	QUIF	PMENT	: 8" Diamet	er Outer/ 4" Diameter Inner C	Casing	DEPTH TO WATER	0	FIRST	COMPL.	24 HRS.			
SAMPL	ING N	ИΕТ	HOD:	10' Sample	Barrel		LOGGED E. Mans							
НАММІ	ER W	EIGI	⊣T:	NA	DROP: NA		RESPONSIBLE PROFESSION M. Hemingway			AL:	REG. NO.			
DEPTH (feet)	Sample No.	<u>a</u>	Blows/ S Foot	NAME (US	DESCRIPTION SCS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. in				97 0	RE	EMARKS			
	0)	(0)		Asphalt	Surface Elevation: 556	6.80 ft. (MSL)			<u> </u>					
_	113			Road base m	ateri a l									
1-	031001013				of to CLAYEY SAND (CL-SC): da of fine sand, 50% fines	rk grayish brow	n (2.5Y		0.2					
2-					(SM): olive brown (2.5Y 4/4), mo e, some mottling of dark organics		and, 40%	_						
3-								-						
4-								-						
5-		X						-						
_								-						
6-								-	0.0					
7-	031001015							-						
-	031							-						
8-							WELL GRAD	ED SAND (SW): dark yellowish b			_	-		
9-					with gravel and fines, black staini			-						
10-								-	- 0.0					
- 11-	016							_						
_	031001016			SANDVIEAN	I CLAV (CL) ITILLE dive brown	(2 EV 4 /2) day	- 909/		- 0.0					
12-					N CLAY (CL) [TILL]: olive brown of m plastic fines, ~10% medium sa			-						
13-								-			. 2004			
 -								-	- 0.0					
14-											RMR K3			
			1.	Geor	natrix Consultants			Project	No. 7168		Page 1 of 5			

Morton Reading FI PROJECT: Log of Boring No. STR05 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL): continued 15 16 0.0 17 18 19 0.0 20 21 SILTY SAND (SM): wet, 80% medium sand, 20% fines, uniform 22 0.0 23-24 0.1 WELL GRADED SAND (SW), 1/2" - 1" gravel, 70% gravel, (1/2" - 1"), 25 20% fines, 10% sand 26 0.0 27 CLAYEY SILT (ML): dark greenish gray (10Y 5/1), some sand, gravel 28-29 SILTY CLAY (CL): dark greenish gray (10Y 4/1) moist, some sand and gravel (1/2" - 1"), hard 30 0.7 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 5

PROJE	CT:	N	/lortor	n Reading FI	Log of B	oring	No. STR	05 (cont'd)		
DEPTH (feet)	Sample No.	Sample AM	Blows/ CA Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. di cementation, react. w/HCl, geo. in			PID READING (ppm)	REMARKS		
<u> </u>	တိ	Š	8 4	AND THE RESERVE TO TH			<u> </u>			
_				SILTY CLAY (CL): continued		-				
32-										
_	-									
33-						-				
_	1									
34-	-									
_										
35-	118									
-	031001018			;						
36-	8									
-	1									
37-										
_	-			01, 411, 6, 111, 107, 51						
38-	-			3" - 4" layer of cobbles at 37.5'						
_	-									
 39-				SILTY SAND (SM): olive (5Y 4/4), wet, 85% fir chemical odor	ne sand, 15% fines,					
-							0.7			
40-	-									
_										
41-						_				
_				SANDY SILT (ML) dark greenish gray (10Y 4/ fine sand	1), wet, 70% fines, 30%					
42-							7.0			
_										
43-										
-										
44-										
_						_				
45-				SANDY CLAY (CL): greenish black (10Y 2.5/1 (subangular to rounded)), with gravel					
-				(
46-										
- -0							4.9			
47-										
41-								~		
48-										
4ð ⁻								RMR K3		
	Geomatrix Consultants Project No. 7168 Page 3 of 5									

Morton Reading FI PROJECT: Log of Boring No. STR05 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION REMARKS Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY CLAY (CL): continued 49 4" cobble present 50-51 Gravel with Sand (GP): interbed 1' thick 52 SILTY SAND and SANDY SILT (SM/ML): dark greenish brown (10Y 3/1), wet, 50% low plastic fines, 50% fine uniform sand, trace gravel, laminated 1" - 2" black 53-54 55 56 57 58 59 FINE TO MEDIUM SAND (SP): dark yellowish brown (10YR 3/4), wet, 70% fine sand, 30% medium sand, trace fines 60-61 62-3.5 63 64 POORLY GRADED SAND WITH SILT (SP-SM): olive brown 65 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 4 of 5

ROJEC				Reading FI	Log of Borir	ng No	. STR05 ((cont'd)
(feet)	Sample No.	Sample M	Blows/ G Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. den cementation, react. w/HCl, geo. inte	sity, structure,	PID	READING (ppm)	REMARKS
				(2.5Y 4/4), wet, 90% fine sand, 10% low plastic	fines			
-						-		
66-						-		
+						-		
67 –						-		
-						3.	8	
68-						-		
+								
69						-		
+		+		Same as above		-		
70-						-		
+						_		
71						-		
1						_		
72				·				
1								
73-								
74						1		
75-								
76-								
77 –						- 3.	9	
70								
78-								
70								
79-								
90.				Total Depth: 79.5 feet below ground surface				
80								
81								
01								
82								
<u></u>								F
				Geomatrix Consultants	Proje	ct No. 71	68	Page 5 of 5

PROJECT: Morton Reading FI Log of Boring						ng No. S	TR06				
BORIN	G LO	CAT	ION:	35' S.E. of S	.E. Corner Bldg. 7		574.66 ft. (
DRILLI	NG C	TNC	RACTO	R: Bowser	Morner		DATE START 3/11/01		7	DATE FINISH 3/12/01	HED:
DRILLI	NG MI	ЕТН	OD:	Rotasonic			TOTAL DEPT 139.5	H (ft.)):	MEASURING Ground St	
DRILLI	NG E	JUIF	PMENT:	8" Diamete	er Outer/ 4" Diameter Inner Casino	9	DEPTH TO WATER	24 HRS.			
SAMPL	.ING N	ИΕТ	HOD:	10' Sample	Barrel		LOGGED BY E. Mansell				,
HAMM	HAMMER WEIGHT:			NA	DROP: NA		RESPONSIBLE PROFESSIO M. Hemingway			AL:	REG. NO.
DEPTH (feet)	Sample No.	<u>o</u>	Blows/ SE Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.	, structure,	PID			RE	MARKS
	Š	Š	ω –	Asphalt	Surface Elevation: 574.66 ft.	(MSL)		-	<u>«</u>		
-			-	Road base (gr	ravel)			+			
1-	19			CLAYEY SAN	CLAYEY SAND (SC): greenish black (10Y2.5/1), transitional color						
2-	031101019				ray reddish mottling, yellowish brown (I, 40% medium plastic fines, hard, trac				1.8		
3-									1.8		
-	_										
4-								-			
5-					(CL): light olive brown (2.5YR5/4), lignard, 70% fines, 25% fine sand, 5% gr				1.8		
6-											
7-	020										
8-	031101020										
-								-			
9-	-								1.3		
10-									2.5		
- 11-								-			
_											
12-	dark greenis				gray (10Y4/1), moist, hard, 90% fines.	, 10% fine	sand,				
13-				trace gravel					6.1		
-								-			
14-				~							RMRK3
				Geon	natrix Consultants		Pr	oject I	No. 7168	F	Page 1 of 9

PROJE	CT:	M	lortor	n Reading FI	Log of Boring No. STR06 (cont'd)					
I.		MPL		DESCRIPTION			Q Q	REMARKS		
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	nsity, structure, er.		PID READING (ppm)	NEWANNO		
				4 - 6" cobbles						
15-	031101021			SILTY CLAY (CL): moist to wet, 100% medium trace gravel (1") subangular to subrounded	plastic fines, hard,		4.4			
16-										
_										
17-				Olive (5Y5/3), light gray mottling			4.6			
18-	-			5 6 11 1 11						
_				Becomes softer with depth		-				
19-	-									
-				Same as above		-				
20-							8.6			
_						-				
21-				•						
22-										
	-						5.6			
23-						-				
-										
24-										
-							4.0			
25-							4.6			
26-										
	-			1 - 2" sand lens						
27-										
-	-						2.0			
28-						-				
-	-									
29-										
30-				Same as above						
-						-				
31-								RMRK3		
				Geomatrix Consultants		Project !	No. 7168	Page 2 of 9		
				Geomatrix Consultants		rojecti	NO. / 108	raye 2 01 9		

Morton Reading FI PROJECT: Log of Boring No. STR06 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION **REMARKS** Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 32-SANDY CLAY (CL): greenish gray (10YR5/1), moist to wet, hard, 90% low to medium plastic fines, 10% fine sand, trace gravel 33-34 35-36 10.7 37 38-SILT (ML): dark greenish gray (10Y4/1): wet, soft, 100% low plastic fines, massive 39 39 - 39.5' : 5" cobble Same as above 40-41 42-43-44 45-9.2 46 47 RMRK3 Page 3 of 9 **Geomatrix Consultants** Project No. 7168

PROJECT: Morton Reading FI Log of Boring No. STR06 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 49-Same as above 50 51 52 53 54 55 8.3 56 Increasing hardness with depth 57 58-59-Same as above 60-62-63 64 65 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 4 of 9

PROJECT: Morton Reading FI Log of Boring No. STR06 (cont'd) SAMPLES PID READING DESCRIPTION REMARKS Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 66 67 68 69 Same as above 70 71 72 73 Becomes harder with depth 74 75 POORLY GRADED SAND (SP): yellowish brown (10Y5/4), 80% fine sand, 20% medium sand, trace fines, 6" interbeds of silty clay 031101023 76 5.4 77 78 SANDY CLAY (CL): gray (5Y5/1), 85% low plastic fines, 15% fine sand, trace gravel (1 - 2" diameter), subrounded 79 SILTY SAND (SM): light olive grown (2.5Y5/4), wet, 70% fine sand, 30% fines, sand gravel interbed at 80.5' 80 Increasing to WELL GRADED SAND (SW) 81 SANDY CLAY (CL) [TILL]:, dark gray (5Y4/1), moist, 90% low plastic 3.0 fines, 10% fine sand, trace gravel 1-2" subangular, hard, 82 RMRK3

Morton Reading FI PROJECT: Log of Boring No. STR06 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. generally massive with trace fractures SANDY CLAY (CL) [TILL]: continued 83-84 85 86-87-031101024 88 89 90 91 92 93 94 95 96 97 3.0 98 99 RMRK3 Project No. 7168 Page 6 of 9 **Geomatrix Consultants**

PROJECT: Morton Reading FI Log of Boring No. STR06 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY CLAY (CL) [TILL]: continued 100 101 102 103 104 6.6 105 106 107 108 109 110 111 112-113-114-115 6.6 116 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 7 of 9

Log of Boring No. STR06 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. SANDY CLAY (CL) [TILL] continued 117 118 119 120 121 122 123 124 125 SILTY CLAY (CL): gray (5Y5/1), moist, 100% low plastic fines, firm, 126 massive 127 128 129 Same as above, becomes harder with depth, increasing gravel with 130 depth, increasing clay with depth 131-132 133 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 8 of 9

PROJECT:

Morton Reading FI

PROJECT: Morton Reading FI

Log of Boring No. STR06 (cont'd)

Project No. 7168

Page 9 of 9

SAMPLES	DESCRIPTION	by c	REMARKS
Sample No. Sample Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	NEW WAY
	SILTY CLAY (CL): continued		
-		-	
!		-	
-		-	
5-			
-		_ _	
6-	SHALE/MUDSTONE, dark greenish gray (10Y4/1), dry, fractures, 1 - 4" fossiliferous layers		
_			
,_			
3-			
9-			
	Total Depth: 139.5 feet below ground surface		
1-			
2-			
-			
3-		-	
-		-	
1 -			
-		-	
5-			
-		-	
5-			
,_			
3-			
9-			
) — — — — — — — — — — — — — — — — — — —			RM

Geomatrix Consultants

PROJECT:	OJECT: Morton Reading FI					Log of Boring No. STR07					
BORING LO	CATI	ON:	Between We	estern Fenceline the Circle		ELEVATION 552.00 ft.					
DRILLING C	ONT	RACTO	DR: Bowser	Morner		DATE STAR: 3/21/01		7	DATE FINISHED: 3/21/01		
DRILLING M	IETH	OD:	Rotasonic			TOTAL DEPTH (ft.): MEASURIN 89.0 Ground 5					
DRILLING E	QUIP	MENT	: 8" Diamet	er Outer/ 4" Diameter Inner Casing		DEPTH TO WATER		FIRST	COMPL.	24 HRS.	
SAMPLING	METH	IOD:	10' Sample	Barrel		LOGGED BY: E. Mansell					
HAMMER W	/EIGH	IT:	NA	DROP: NA	RESPONSIBLE PROFESSIONAL: M. Hemingway		AL:	REG. NO. NA			
(feet) Sample	Sample	Blows/ Sa Foot	NAME (US	DESCRIPTION CCS): color, moist, % by wt., plast. density, s cementation, react. w/HCl, geo. inter.	structure,	PID (ppm)		RE	MARKS		
Sa	Sa	置山	0 b - I4	Surface Elevation: 552.00 ft. (MSL)			8.			
_			Asphalt				_				
1-	Т			ILL]: black to dark brown, ~95% mediun	n plastic	o fines,	_				
2-			trace gravel,	-5% sand, iron lamination				5.2			
3-											
4-				•							
5-								0.7			
				H CLAY (GP-GC): tan mottling, moist, and plastic fines, trace medium sand	-80% gı	ravel,	-				
6-							_				
7-								0.0			
-				ADED SAND (SP): dark grayish brown, , ~10% fine gravel, 6" silt lens at 7.5 - 8'		90%	_				
8-				,			_				
9-			_								
_			Same as abor								
10-								0.0			
11-											
12-											
13-								0.0			
137								0.0		i man	
14				·	<u>-</u>				· · · · · · · · · · · · · · · · · · ·	RMRK3	
		1	Geor	natrix Consultants		Pr	oject I	No. 7168	F	Page 1 of 6	

PROJECT: Morton Reading FI Log of Boring No. STR07 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 15 16 0.3 17 16.8' - 18' Black staining, chemical odor 0.7 18 SANDY LEAN CLAY (CL) [TILL]: dark greenish gray (10Y 4/1), moist, ~90% high plastic fines, ~10% medium sand, trace fine gravel, hard 19 20 4" cobble - fossiliferous 21 22 0.0 23 24 25 26 0.0 27 WELL GRADED SAND (SW): dark greenish gray (10Y 4/1), wet, ~95% sand gravel, ~5% sand 28 29 30 4" clay lens 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 6

PROJECT: Morton Reading FI Log of Boring No. STR07 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. WELL GRADED SAND (SW): continued 32 33 34 3" clay lens 35 35' - 35.75' lean clay lens 36 37 38 0.0 39 39' - 39.5' clay seam 40-41 42 Less gravel than above 43 44 LEAN CLAY (CL): greenish gray (10Y 5/1), moist, 100% high plastic fines, trace fine sand, soft weak bedding 44 - 45', few black laminations, no odor 45 46 47 48 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 3 of 6

PROJECT: Morton Reading FI Log of Boring No. STR07 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. LEAN CLAY (CL): continued 49 SILT (ML): greenish gray (10 Y 5/1), moist, ~100% low plastic fines, soft, abundant roots 50 51.5' - 59' no roots present 52 53 54 5**5** 56 56' - 56.5' medium sand seam 57 58 Increase in clay content, soft to firm, no roots present 59 60-POORLY GRADED SAND (SP): dark greenish gray (10Y 3/1), ~95% medium sand, ~5% low plastic fines 61 62 62' - 62.5' silt lens, medium plasticity Increasing fine content 63 64 65 RMRK3 Page 4 of 6 **Geomatrix Consultants** Project No. 7168

POORLY GRADED SAND (SP): continued SILTY SAND (SM); dark gray (5Y 4/1), moist to wet, ~60% fine sand, ~40% low plastic fines, trace gravel, semi-coheaive 67.5' - 68' 2 - 4" cobbies POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand One of the sand of	ROJECT: Morton	Reading FI	₋og of Boring N	lo. STR07 (cont'd)
POORLY GRADED SAND (SP): continued SILTY SAND (SM); dark gray (SY 4/1), most to wet, ~60% fine sand, ~40% low plastic fines, trace gravel, semi-cohesive	-	NAME (USCS): color, moist, % by wt., plast. density, structul	re,	PID (ppm) (ppm)
SILTY SAND (SM); dark gray (5Y 4/1), moist to wet60% fine sand40% fow plastic fines, trace gravel, semi-cohesive 67.5' - 68' 2 - 4" cobbies POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand Olive (5Y 4/3) Olive (5Y 4/3) 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor Same as above Black laminations continue to 81', no chemical odor 0.0 Black laminations continue to 81', no chemical odor		POORLY GRADED SAND (SP): continued		
SILITY SAND (SM) dark gray (sY 4/1), most to vet, ~50% fine sand, ~40% five plastic fines, trace gravel, semi-cohesive 67.5 - 68' 2 - 4" cobbles POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand OI-11-12-13-100% fine sand Olive (SY 4/3) Olive (SY 4/3) 77.5 - 79' black terminations 1/4 - 1/2", no chemical odor Same as above Black terminations continue to 81', no chemical odor 0.0 Black terminations continue to 81', no chemical odor	-	, ,		
-40% low plastic fines, trace gravet, semi-cohesive 67.5' - 68' 2 - 4" cobbles POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand Olive (5Y 4/3) Olive (5Y 4/3) 77.5' - 79' black faminations 1/4 - 1/2", no chemical odor Same as above Elack laminations continue to 81', no chemical odor 0.0 Black laminations continue to 81', no chemical odor	66-	SILTY SAND (SM): dark gray (5Y 4/1) moist to wet ~60%	fine sand	
8 - 67.5' - 68' 2 - 4" cobbles POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand O - 1	-	~40% low plastic fines, trace gravel, semi-cohesive	-	
9 - POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand 1	7-			
POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand O- O- O- O- O- O- O- O- O- O	-	C7 51 C010 4H		
POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand Olive (SY 4/3) Olive (SY 4/3) 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor Same as above Black laminations continue to 81', no chemical odor	8-	67.5 - 68 2 - 4" CODDIES		
POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand Olive (SY 4/3) Olive (SY 4/3) 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor Same as above Black laminations continue to 81', no chemical odor 1— 2.				
POORLY GRADED SAND (SP): dark greenish gray (10Y4/1), wet, 100% fine sand Olive (SY 4/3) Olive (SY 4/3) 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor Same as above Black laminations continue to 81', no chemical odor 1— 2.	g_			
0 - 1 - 2 - 3 - Olive (5Y 4/3) 4 - 5		POORLY GRADED SAND (SP): dark greenish gray (10Y4	l-/1), wet,	
Olive (5Y 4/3) Olive (5Y 4/3) 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor Same as above Black laminations continue to 81', no chemical odor		100% line sand		
2-33- Olive (5Y 4/3) 4-4-55 0.0 7-7-88- 9- Same as above - 0.0 Black laminations continue to 81', no chemical odor - 0.0 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-				
2-33- Olive (5Y 4/3) 4-4-55 0.0 7-7-88- 9- Same as above - 0.0 Black laminations continue to 81', no chemical odor - 0.0 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-				
3- Olive (5Y 4/3) 4	1			
3- Olive (5Y 4/3) 4	-			
Olive (SY 4/3)	2-	·		
Olive (5Y 4/3)	-			
4 -	3-	Olive (5Y 4/3)		
5-	-	, ,		
77.5' - 79' black laminations 1/4 - 1/2", no chemical odor 9	4-			
77.5' - 79' black laminations 1/4 - 1/2", no chemical odor 9	-			
77-	5-			0.0
77- 77.5' - 79' black laminations 1/4 - 1/2", no chemical odor - 0.0 Same as above - 0.0 Black laminations continue to 81', no chemical odor - 0.0	-		-	
77.5' - 79' black laminations 1/4 - 1/2", no chemical odor 9 - Same as above Black laminations continue to 81', no chemical odor 1	6-			
77.5' - 79' black laminations 1/4 - 1/2", no chemical odor 9 - Same as above Black laminations continue to 81', no chemical odor 1	_			
77.5' - 79' black laminations 1/4 - 1/2", no chemical odor 9 - Same as above Black laminations continue to 81', no chemical odor 1	7-			
Same as above Black laminations continue to 81', no chemical odor 1- 2				
Same as above Black laminations continue to 81', no chemical odor 1- 2	8-	77.5' - 79' black laminations 1/4 - 1/2", no chemical odor		
Same as above O-Black laminations continue to 81', no chemical odor 1				
Same as above O Black laminations continue to 81', no chemical odor 1				0.0
Black laminations continue to 81', no chemical odor 1 -		Same as above		
Black laminations continue to 81', no chemical odor 1 -				0.0
2 R		Black laminations continue to 81', no chemical odor		0.0
2 R				
R	11			
R				
	2			R
Geomatrix Consultants Project No. 7168 Page 5 of 6		Geomatrix Consultants	Project No.	7168 Page 5 of 6

Log of Boring No. STR07 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 83 84 85 86 87 88 89 Total Depth: 89 feet below ground surface 90 91 92 93 94 95 96 97 98 99 RMRK3 Project No. 7168 Page 6 of 6 **Geomatrix Consultants**

PROJECT:

Morton Reading FI

PROJE	CT:	Ν	/lorton	Reading FI			Log	of Borii	ng No. S	TR08
BORIN	G LO	CAT	ION:	S.W. of Bld	g. 24		'ATION AND 73 ft. (MSI			
DRILLII	NG C	ONT	RACTO	PR: Bowse	er Morner	DATE 3/26	STARTED: /01		DATE FINISH 3/26/01	HED:
DRILLI	NG M	ETH	OD:	Rotasonic		тот <i>а</i> 79.0	AL DEPTH (ft):	MEASURING Ground St	
DRILLI	NG E	QUIF	PMENT	: 8" Diame	eter Outer/ 4" Diameter Inner Casi	ng DEPT		FIRST	COMPL.	24 HRS.
SAMPL	ING N	MET	HOD:	10' Sample	e Barrel		GED BY: lanse ll			
НАММ	ERW	EIGI	HT:	NA	DROP: NA		PONSIBLE PI lemingway		IAL:	REG. NO.
DEPTH (feet)	Sample No.	Sample MA	Г	NAME (L	DESCRIPTION USCS): color, moist, % by wt., plast. densit cementation, react. w/HCl, geo. inter. Surface Elevation: 553.73			PID READING (ppm)	RE	MARKS
_				Gravel, base		(=)				
1-	032601054				(CL): very dark gray (5Y 3/1), moist, - firm to hard, trace fine gravel	-100 medium				
2-	032						-	1.2		
3-							_			
4-				Becomes so	fter, more brown in color than above		_	0.4		
5- 										
6-					RADED SAND (SP): dark yellowish brough fine to medium sand, ~5% gravel, no			16.9		
7-		$\left \right $					-			
8-		$\left \right $					_			
9-				9' - 14.5' Sai	me as above, black staining, wet, cher	mical odor	_			
10-							_			
11-							_	29.8		
12-	56						-			
13-	5 032601056						-	40.8		. 90.
_	032601055						-			
14-	8			∕⁄ © Geo	matrix Consultants		Project	No. 7168	F	Page 1 of 5
1			-		voitouituitto		, , 0,000		'	_30 . 5. 0

PROJECT: Morton Reading FI Log of Boring No. STR08 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [TILL]: dark greenish gray (10Y 4/1), moist, ~85% high plastic fines, ~15% fine sand and gravel, hard 15 16 17 18 19 Same as above 20 21 22 23 24 25 26 27-3.2 28 28' - 28.5' sand and gravel (1" - 2") SILT (ML): dark greenish gray (10Y 3/1), moist, ~100% low to medium 29 plastic fines, homogenous 29.5' - 29.7' - sand lens 30 30.2' - 30.5' - sand lens RMRK3 Page 2 of 5 **Geomatrix Consultants** Project No. 7168

PROJE	ECT: Morton Reading FI SAMPLES				Log of Bo	ring	No. STR	08 (cont'd)
I.			LES	DESCRIPTION			9	REMARKS
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. in	ensity, structure, er.		PID READING (ppm)	REWARKS
_				SILT (ML): continued				
32-					(10)(0)(1)	_ -		
				POORLY GRADED SAND (SP): dark greenish to wet, ~100% coarse sand, trace fines	gray (10Y 3/1), moist	_		
33-				SILT (ML): dark greenish gray (10Y 3/1), moist plastic fines, homogeneous	, ~100% low to medium			
34-								
_								
35-								
36-								
_								
37-						-		
38-								
_								
39-				Same as above				
40-								
_								
41-								
42-								
42-								
43-								
_	. 950							
44	032601058							
45-							9.6	
_				45.5' - 46' Black laminations				
46-								
47 –				Dark yellowish brown (10YR 4/4)				
						-		
48-								RMR
			1	Geomatrix Consultants	P	roject N	No. 7168	Page 3 of 5

PROJECT: Morton Reading FI Log of Boring No. STR08 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SILT (ML): continued 49 Same as above, dark greenish gray 50 51 52-POORLY GRADED SAND (SP): olive brown (2.5Y 4/3), moist to wet, ~95% fine to medium sand, ~5% low plastic fines 53 54-55 56-57-8.8 58-59-Same as above 60 61-62-63-64 65 Project No. 7168 Page 4 of 5 **Geomatrix Consultants**

PROJE	CT:	N	lorton	Reading FI	Log of Bor	ing	No. STR	08 (cont'd)
I		MPL		DESCRIPTION			g Z	REMARKS
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. ir	ensity, structure, nter.		PID READING (ppm)	TALIW I I I I
				POORLY GRADED SAND (SP): continued				
-							5.4	
66-						_	5.1	
67								
67								
68-								
69-								
09				Same as above		1		
70-								
"-								
71-						_		
-						-		
72-				\$		_		
-						-		
73-								
-								
74-								
_								
75-						-		
_						_		
76-						-		
-								
77-						-		
-							3.7	
78-						-		
-						-		
79-				Total Depth: 79 feet below ground surface		\dashv		
_								
80-								
_						-		
81-								
-								
82-								RMRK3
			1	Geomatrix Consultants	Pro	oject N	No. 7168	Page 5 of 5

PROJECT: Morton Reading FI		Lo	g o	f Borin	ng No. S	TR09
BORING LOCATION: E. of Main Gate on Insid	e Fence Line	ELEVATION A 563.94 ft. (N				
DRILLING CONTRACTOR: Bowser Morner		DATE STARTE 4/4/01			DATE FINISHED: 4/4/01	
DRILLING METHOD: Rotasonic		TOTAL DEPTH 79.0	⊣ (ft.):		MEASURING Ground St	
DRILLING EQUIPMENT: 6" Diameter Outer/ 4"	Diameter Inner Casing	DEPTH TO WATER	F	IRST	COMPL.	24 HRS.
SAMPLING METHOD: 10' Sample Barrel		LOGGED BY: E. Mansell				
HAMMER WEIGHT: NA DROP:	NA	RESPONSIBLE PROFESSION M. Hemingway			AL:	REG. NO.
王 宗 w w se NAME (USCS): color, m	DESCRIPTION poist, % by wt., plast. density, structure, preact. w/HCl, geo. inter.			PID READING (ppm)	RE	MARKS
	e Elevation: 563.94 ft. (MSL) AW 14-10			<u> </u>		
- Grass			1+			
1- SANDY CLAY (CL) [FILL]						
2-						
				0.0		
3-			-			
	•					
4-						
5- CLAYEY SAND (SC): dark	grayish brown (10YR 4/1), moist to	wet		0.0		
-			-			
6-	·		$ \uparrow $			
7-						
040401069				0.0		
8-0400						
	rn (10YR 5/4), moist, ~95% medium	plastic				
9 fines, ~5% sand and grave		Monaning Consoning of the		0.0		
	WITH SILT (SM): dark yellowish bi lium sand and gravel, ~20% mediu		_			
10.5 - 11.5' clay lens						
				0.0		
12-						
LEAN CLAY (CL): olive gra ~30% fine sand and gravel	ay (5Y 4/2), moist, ~80% high plasti , hard	c fines,				
14						RMR K3
Geomatrix Cons	ultants	Pro	ject N	lo. 7168	F	Page 1 of 5

Morton Reading FI PROJECT: Log of Boring No. STR09 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 0.0 LEAN CLAY (CL) continued 15 16 0.0 17 2 - 3" cobble 18 19 Same as above 20 21 0.0 22 23 CLAY (CL): dark gray (5Y 4/1), moist, ~100% high plastic fines, soft to firm, homogeneous 0.0 24 25 26 0.0 27 Becomes softer with depth 28 0.0 29 Same as above 30 31 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 2 of 5

PROJECT: Morton Reading FI Log of Boring No. STR09 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) Sample No. Sample DESCRIPTION **REMARKS** Biows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CL): continued 32-33-34 0.0 35-36-37 38-39-Same as above 40-41 42-43 44 0.0 45-46 47 48 RMRK3 Page 3 of 5 **Geomatrix Consultants** Project No. 7168

FROJE	Log of Boring No. STR09 (cont							ont'd)
DEPTH (feet)	Sample No.	Sample Manager	DESCRIPTION	density, structure, inter.		PID READING (ppm)	F	EMARKS
			CLAY (CL) continued					
49-			Same as above					
50-								
51-								
52-								
53-			Becomes harder					
54 -								
55-			SANDY LEAN CLAY (CL) [TILL]: dark gray (~80% medium plastic fines, ~20% sand and	5Y 4/1), dry to moist, gravel, firm to hard		0.0		
56-								
57 -	_							
58-	_				_			
59-			Same as above		_			
60-								
61 -								
62-			62 - 62.5' 2 - 3" cobbles					
63-					-			
64 -			64 - 64.5' sand lens			0.0		
65								RMRK3
		-amm	Geomatrix Consultants	Proje	e ct N	No. 7168		Page 4 of 5

Morton Reading FI

PROJECT:

PROJECT: Morton Reading FI

Log of Boring No. STR09 (cont'd)

Project No. 7168

Page 5 of 5

	PLES	DECODINE	<u>්</u>	DEMARKS
Sample No.	Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING	REMARKS
		SANDY LEAN CLAY (CL) [FILL]: continued		
7 11				
6-			_	
4			_	
7-				
4 11				
8-				
		68.5' - 69' : POORLY GRADED SAND WITH GRAVEL (SP) [LENS]:		
9-		dark gray (5Y 4/1), wet, ~70% medium sand, 25% gravel (1" - 2"), ~5% medium plastic fines		
1 11		·		
o-		SANDY LEAN CLAY (CL): continued		
+		, ,		
1-				
-				
2-				
3-				
4-				
-				
5-				
-				
6-				
_				
7-				
<u> </u>				
8-				
7				
9	+ +	Total Depth: 79 feet below ground surface		
-		·		
o-				
4				
1-				
32		· · · · · · · · · · · · · · · · · · ·		RMR

Geomatrix Consultants

PROJECT: Morton Reading FI				Log of Boring No. STR10				
BORING LOCATION:	N.W. Corner	of Bldg. 1	1	ELEVATION AND DATUM: 559.74 ft. (MSL)				
DRILLING CONTRACTO	R: Bowsei	r Morner	DATE STA 4/7/01	RTED:		DATE FINISH 4/7/01	HED:	
ORILLING METHOD:	Rotason ic		39.0	`):	MEASURING Ground Su		
DRILLING EQUIPMENT:	8" Diamet	er Outer/ 4" Diameter Inner Casing	DEPTH TO WATER		FIRST	COMPL.	24 HRS.	
SAMPLING METHOD:	10' Sample	Barrel	LOGGED E	ell				
HAMMER WEIGHT:	NA	DROP: NA	RESPONS M. Hemir		ROFESSION	AL:	REG. NO.	
DEPTH (feet) Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION SCS): color, moist, % by wt., plast. density, struct cementation, react. w/HCl, geo. inter.	ure,		PID READING (ppm)	RE	MARKS	
ο ο m	Asphalt base	Surface Elevation: 559.74 ft. (MSL))		œ			
- XI I	, topman baco			-				
1 7 7	SAND WITH	CLAY (SC) [FILL]: some black material		-				
2-								
				_	0.0			
3-				-				
-	SANDY CLAY	(SC): very dark gray (2.5Y 3/1), moist, ~80	 % low	_ -				
4-		~20% medium sand, firm		-				
				-	0.0			
5					0.0			
6-				-				
_				-				
7-	CLAY (CL): 0		 ic fines,	_ -				
-		nd, firm to hard		-	0.0			
8-				-				
9-								
	Same as abo	ve		-				
10-	Olive (5Y 4/3)			-	0.0			
	01110 (01 110)			-				
11 - 11		ck discoloration, chemical odor, very soft, in	crea sing	-	0.8			
	sand content	(30%)		_ -				
12-		N CLAY (CL) [TILL]: olive brown (2.5Y 4/3), res, ~15% sand/gravel, hard	moist, ~85%		0.4			
13-		,		-	-		-	
_				-				
14		·					RMRK3	
1	Geor	natrix Consultants		Project	No. 7168	P	age 1 of 3	

Morton Reading FI PROJECT: Log of Boring No. STR10 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [TILL]: continued 15 0.0 Dark greenish gray (10Y 3/1), very hard 16 17 0.0 18

0.0

0.0

0.0

0.0

0.0

Project No. 7168

RMRK3

Page 2 of 3

19

20

21

22

23

24

25

26

27

28

29

30

31

Same as above

21.7' - 22' gravel seam

4" cobble

2" gravel seam

1" coarse sand seam

1" gravel seam, dark gray (2.5Y 4/1)

Geomatrix Consultants

22.5' - 22.7' gravel seam, light olive brown (2.5Y 5/4)

Log of Boring No						ı No. STR10 (d	ont'd)
DEPTH (feet)	Sample No.	Sample N	Blows/ G Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. concernation, react. w/HCl, geo. in	lensity, structure, nter.	PID READING (ppm)	REMARKS
				SANDY LEAn CLAY (CL) [TILL] continued			
32-							
32							
33-							
_							
34-							
_							
35-							
-					-		
36-					-		
_				<1" sand lens	-		
37-					-		
				3" cobble	-		
38-					-		
-	_				-		
39-		\perp		Total Depth: 39 feet below ground surface			
-	-						
40-							
_							
41-							
10							
42-							
43-							
43					_		
44-							
_					_		
45-					-		
_	-				_		
46-					-		
-					_		
47-					-		
_					-		, man,
48-							RMRK3
				Geomatrix Consultants	Proiect	No. 7168	Page 3 of 3
					,,,,,		<u> </u>

Morton Reading FI

PROJECT:

PROJECT: Morton Reading FI				Log of Boring No. STR11				
BORING LOCATION: N.E. C	ELEVATION AND 578.24 ft. (MS							
DRILLING CONTRACTOR: B	DATE STARTED 8/20/01		DATE FINISHED: 8/21/01					
DRILLING METHOD: Rotaso	TOTAL DEPTH (1 120.0	ft.):	MEASURING POINT: Ground Surface					
DRILLING EQUIPMENT: Gus	FIRST	COMPL. 24 HRS.						
SAMPLING METHOD: 10' Re	LOGGED BY: T. Jennings							
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE F	RESPONSIBLE PROFESSIONAL: M. Hemingway					
DEPTH (feet) Sample No. Sample Blows/ Foot Foot	DESCRIPTION ME (USCS): color, moist, % by wt., plast. densi cementation, react. w/HCl, geo. inter.		PID READING (ppm)	REMARKS				
5	Surface Elevation: 578.24 terial Y SAND (SC): dark brown, wet, ~85% cla ium sand, ~5% calcareous pebbles, loose Y GRAVELLY CLAY (CL): light brown, dam n sand, ~5% gravel, slightly plastic	p, ~75% clay, ~20%	- 0.0 - 0.0 - 0.0 - 0.0 - 0.0 - 0.0 - 0.0					
13-								
14				RMRK3				
//X <u></u>	Geomatrix Consultants	Projec	t No. 7168	Page 1 of 8				

Morton Reading FI Log of Boring No. STR11 (cont'd) PID | READING | (ppm)_ SAMPLES DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CH): continued 0.0 15-16 17 0.0 18 19 20 21 22 0.0 23 24 25 Same as above, no odor 26 27 28 0.0 29 30 RMRK3 /X **Geomatrix Consultants** Project No. 7168 Page 2 of 8

PROJECT: Morton Reading FI Log of Boring No. STR11 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CH): continued 32 0.0 33 34 35 Same as above 36 37 0.0 38 SANDY CLAY (CL): grayish brown, wet, ~50% fine sand, ~50% clay, 39 slightly plastic, soft CLAY (CH): yellowish brown, damp, very stiff, very plastic 40 SANDY GRAVELLY CLAY (CL): yellowish brown, ~70% clay, stiff, ~20% fine to medium sand, ~10% fine gravel (<1/4"), moderately 42plastic 0.0 43 SAND (SP): brown, wet to saturated, fine to medium grained, loose 44 45 46 47 0.0 SANDY GRAVELLY CLAY (CL): brown, wet, ~85% clay, ~10% fine sand, ~5% fine gravel, stiff, moderately plastic 48 Page 3 of 8 **Geomatrix Consultants** Project No. 7168

OJECT: Morton Reading FI					Log of Boring No. STR11 (cont'd)						
			LES	DESCRIPTION		9 7	DEMADES				
(feet)	Sample No.	Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int		PID READING (ppm)	REMARKS				
_				SANDY GRAVELLY CLAY (CL): continued	-						
-9I -			_	GRAVELLY SAND (SW): brown to dark brown, medium grained with ~10% fine to very coarse							
0-				diameter), loose	-						
1-					-						
_					-						
52 – –					-	0.0					
53-	082001171				-						
- 54 -	085				-						
- 5-					-						
_											
- 66 -				SANDY GRAVELLY CLAY (CL): greenish gray damp, ~70% clay, ~20% very fine to coarse gravel, locally <1/4" diameter (granitic), glacial	ained sand ~10% -						
7 – –				to slightly plastic, very hard	un, very sun, nomplasue						
8-					-	0.0					
- - 9					-						
_					-						
-0 -					-						
- 11 -					-						
2-					-						
- 3-	172				-	0.0					
_	082001172				-						
- 44 -				SILTY CLAY (CL): dark gray, wet to saturated, ~30% - 40% silt, locally stiff to locally friable, sl							
55-							RN				

PROJECT: Morton Reading FI Log of Boring No. STR11 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SILTY CLAY (CL): continued 66 67 68 69 70 0.0 71 72 73 74 75 Same as above 76 77 78 79 80 81 82 RMRK3 Project No. 7168 Page 5 of 8 **Geomatrix Consultants**

Log of Boring No. STR11 (cont'd) SAMPLES PID READING DEPTH (feet) DESCRIPTION REMARKS Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 0.0 SAND (SP): brown, saturated, very fine to medium grained, loose to moderately compact, well-bedded with silt laminae locally 83-84 85 86 SANDY GRAVELLY CLAY (CL): gray, wet, ~80% clay, ~10% fine to coarse grained sand, ~10% coarse gravel (<2"), stiff, moderately plastic 87-88 89 SILTY CLAY (CL): gray, wet, moderately loose and soft, moderately plastic 90 91 92 SAND (SP): brown, saturated, loose to slightly compact, fine to medium grained 93 94 95 96 97 98 99 RMRK3 11990 **Geomatrix Consultants** Project No. 7168 Page 6 of 8

Morton Reading FI

Morton Reading FI PROJECT: Log of Boring No. STR11 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SAND (SP): continued 100 101 0.0 102-103 104 105 Same as above No Recovery from 105 to 120 in loose sand 106 107 108 109 110 111-112-

Same as above RMRK3 Project No. 7168 Page 7 of 8 **Geomatrix Consultants**

113

114

115

116

Log of Boring No. STR11 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION **REMARKS** Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SAND (SP): continued 117 118 119 120 Total Depth at 120 feet below ground surface 121 122-123-124 125 126 127 128-129 130-131-132-133 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 8 of 8

PROJECT:

Morton Reading FI

PROJECT: Morton Reading FI							Log of Boring No. B01							
BORING	S LOC	CAT	ION:	Baseball Fiel	d		ELEVATION Ground		DATUM: ft. (MSL)					
DRILLIN	IG CC	ТИС	RACTO	OR: H.C. Nu	tting		DATE STA 10/9/01	ARTED:		DATE FINISH 10/9/01				
DRILLIN	IG ME	ETH	OD:	Direct Push			TOTAL DE 12.0	EPTH (ft.):	MEASURING Ground Su				
DRILLIN	IG EC	QUIF	PMENT	Geoprobe	5400		DEPTH TO WATER	0	FIRST	COMPL.	24 HRS.			
SAMPLI	NG M	ИΕТ	HOD:	Macro Tool			LOGGED E. Mans							
HAMME	R W	EIGI	HT:	NA	DROP: NA			SIBLE PROFESSIONAL: REG. NO.						
DEPTH (feet)	Sample No.		Blows/ ST Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. c cementation, react. w/HCl, geo. ii	density, structure, nter.			PID READING (ppm)	REM	MARKS			
	S	S	Ш	Grass	Surface Elevation: Gr	ound 562.17 ft. (N	//SL)		LE.					
1-	3				(CL): yellowish red (5YR 4/6), w plastic fines	moist, ~30% me	dium	_						
2-	100901183													
3-														
4-		V			NDED SAND (SP): light yellowis % fine sand, trace to		6/4), dry	_	0.0					
5-		\bigcap						_						
6-								_						
7-														
8-								-	0.0					
9-		\bigcap		Same as abov	e, trace 1" gravel, moist			-						
10-								-						
11-	100901184							-						
12-	-			Total Depth: 1	2 feet below ground surface									
13- -														
14					·						RMRK3			
				⊘ Geom	atrix Consultants			Project	No. 7168	Pa	age 1 of 1			

PROJECT: Morton Reading FI					Log of Boring No. B02						
BORIN	G LOC	CATI	ON:	Baseball Fiel	d		ELEVATION Ground 56				
DRILLI	NG CC	ONT	RACT	OR: H.C. Nu	tting		DATE STAR 10/9/01			DATE FINI 10/9/01	SHED:
DRILLI	NG ME	ETH	OD:	Direct Push			TOTAL DEPT			Ground :	NG POINT: Surface
DRILLI	NG EC	UIF	MENT	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPL	ING M	1ETH	HOD:	Macro Tool		_	LOGGED BY E. Mansell				
НАММ	ER WE	EIGH	HT:	NA	DROP: NA		RESPONSIB M. Heming			IAL:	REG. NO.
DEPTH (feet)	Sample No.	Sample 7	Blows/ CA Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. dens cementation, react. w/HCl, geo. inter.				PID READING (ppm)	F	REMARKS
	S	S	<u> </u>	Grass	Surface Elevation: Ground	d 562.01 ft. (N	MSL)		<u> </u>		
1- -	100901186			SANDY CLAY low plastic fine							
2-											
3-											
4-					ADED SAND (SP): pale brown (10Y	'R 6/3), mois	st,	-	0.0		
5-				~ 100% line to	medium sand, trace 1" gravel						
6-											
7-											
8-				Same as abov	e				0.0		
9-											
10-											
- 11-	87										
- 12-	100901187			Total Donth: 4	2 feet helew ground surface			_			
- 13-				Total Depth: 1	2 feet below ground surface						
_											
14-				Geom	natrix Consultants		Pr	oject	No. 7168		Page 1 of 1
											1

PROJECT: Mortor	n Reading FI			Log of Boring No. B03					
BORING LOCATION:	S. of Hike ar	nd Bike Trail		ON AND DATU I 551.86 ft. (N					
DRILLING CONTRACTO	OR: H.C. Nu	utting	DATE ST 10/9/01	ARTED:		DATE FINISHED: 10/9/01			
DRILLING METHOD:	Direct Push		12.0	EPTH (ft.):		MEASURING POINT: Ground Surface			
DRILLING EQUIPMENT	r: Geoprobe	5400	DEPTH T WATER	FIRST		COMPL. 24 HRS			
SAMPLING METHOD:	Macro Tool		LOGGED E. Man	sell					
HAMMER WEIGHT:	NA	DROP: NA		ISIBLE PROFES ningw <mark>ay</mark>	SSIONA	L: REG.			
DEPTH (feet) Sample No. Sample Sample Blows/ Sample Foot	NAME (US	DESCRIPTION CCS): color, moist, % by wt., plast. der cementation, react. w/HCl, geo. inte	r.		READING (ppm)	REMARKS			
	Grass	Surface Elevation: Grou	nd 551.86 ft. (MSL)						
1- 88 88 1- 88 1- 88	SANDY CLAY	(CL): dark yellowish brown (10YF c fines, ~20% fine to medium sand	l, firm		0				
6- - 7- - 8- - 9- - 10- - 11- - 681106001 - 12- - 13- - 14	medium sand Same as abov 2"	,~10% low plastic fines, trace 1" g	ravel	- O.	0				
	/X Geor	natrix Consultants		Project No. 71	68	Page 1 of 1	RMRK3		
1				1		90 , 51 ,			

PROJECT: Morton Reading FI							Log of Boring No. B04					
BORIN	G LOC	ATI	ON:	S. of Recreat	ion Center		ELEVATION A					
DRILLII	NG CC	ITNC	RACTO	R: H.C. Nu	utting		DATE START 10/9/01			DATE FINIS 10/9/01	SHED:	
DRILLII	NG ME	ETH	OD:	Direct Push			TOTAL DEPT 12.0			MEASURIN Ground S		
DRILLII	NG EC	UIP	MENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.	
SAMPL	ING M	IETH	HOD:	Macro Tool			LOGGED BY E. Mansell					
HAMMI	ER WE	EIGH	IT:	NA	DROP: NA		RESPONSIBI M. Heming			AL:	REG. NO.	
DEPTH (feet)		Sample N	Blows/ G Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.	, structure,			PID READING (ppm)	R	EMARKS	
ш	SS _	S	<u>a</u>	Grass	Surface Elevation: Ground 5	556.09 ft. (N	MSL)		₹			
_	191				D (SC): brown (10YR 4/3), moist, ~80)% mediur	n sand					
1-	100901191			~20% fines,	_ (==,====,===,====,====,====,====,====,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	-				
	1							-				
2-	100901190							-				
_	-							_				
3-												
4-												
_				Same as abov	re, ~100% fine to medium sand, trace	fines		-				
5-								_				
_								-				
6-								-				
								-				
7-								-				
-								-				
8-				Same as abov	e			-				
0								-				
9-												
10-												
-				Tuesda () 00				-				
11-	192			Trace 1 - 2" gr	aveı			-				
_	10090192							-				
12-			-	Total Depth: 1	2 feet below ground surface			-				
_				·	-			-				
13-								-				
14-					<u></u>							
14				Geom	natrix Consultants		Pro	oiect	No. 7168		RMRK3 Page 1 of 1	
								,				

PROJECT: Morton Reading FI							Log of Boring No. B05					
BORING	G LO	CATI	ION:	E. of Baseba	II Field		ELEVATION Ground		DATUM: ft. (MSL)			
DRILLIN	NG C	ТИС	RACTO	DR: H.C. Nu	itting		DATE ST. 10/9/01			DATE FINIS 10/9/01	SHED:	
DRILLIN	NG M	ETH	OD:	Direct Push			TOTAL D	EPTH (ft.):	MEASURIN Ground S		
DRILLIN	NG E	QUIF	PMENT	: Geoprobe	5400		DEPTH T	0	FIRST	COMPL.	24 HRS.	
SAMPL	ING N	ИΕΤΙ	HOD:	Macro Tool			LOGGED E. Mans				<u> </u>	
НАММЕ	ERW	EIGI	HT:	NA	DROP: NA			SIBLE PF	ROFESSION	IAL:	REG. NO.	
DEPTH (feet)	Sample No.	Sample N	Blows/ CA Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., pla cementation, react. w/HCl, ge				PID READING (ppm)	R	EMARKS	
	Se	တိ	8.	Cross	Surface Elevation:	Ground 563.61 ft. (M	MSL)		쭚			
_				Grass	(CL): reddish brown (5YR 4	1/3) moiet ~80% m		-				
1-	93				20% medium sand, firm	70), moist, 0070 ii	edidili	-				
	100901193							-				
2-	+							-				
								-				
3-												
4-			,					_	0.0			
_		X		Same as abov				-				
5-				Same as abov	C			-				
_								_				
6-												
7-								_				
_				POORLY GRA	ADED SAND (SP): brown (1	0YR 5/3) moist ~1	00%					
8-				medium sand	.525 67 4.12 (61). 516 H. (1	0 1 1 C 0 70 7, 111 0 10 C,	0070	-	0.0			
_								-				
9-								-				
10-												
_								-				
11-	194							-				
_	100901194							-				
12-	-			Total Depth: 1	2 feet below ground surface							
13-												
, 13 –								-			. •	
14-											RMRK3	
			-	⊘ Geom	natrix Consultants			Project	No. 7168		Page 1 of 1	

PROJECT: Mort	ton Reading FI			Log of Boring No. B06						
BORING LOCATION:	: Former Mur	. Water Supply Field	1	ELEVATION AI Ground 554.						
DRILLING CONTRAC	CTOR: H.C. N	utting		DATE STARTE 10/9/01		DATE FINISI	HED:			
DRILLING METHOD:	Direct Push			TOTAL DEPTH	(ft.):	MEASURING Ground St				
DRILLING EQUIPME	NT: Geoprobe	e 5400		DEPTH TO WATER	FIRST	COMPL.	24 HRS.			
SAMPLING METHOD	D: Macro Too			LOGGED BY: E. Mansell		-				
HAMMER WEIGHT:	NA	DROP: NA			PROFESSION	AL:	REG. NO.			
DEPTH (feet) Sample No. Sample Blows/	NAME (II	DESCRIPTION SCS): color, moist, % by wt., plast. dens cementation, react. w/HCl, geo. inter Surface Elevation: Grour	sity, structure,		PID READING (ppm)	RE	MARKS			
	Grass - topso	oil black 0" - 8"								
1- 56		Y (CL): brown (10YR 4/3), moist, ~8 sand, firm, roots (0.5' - 2')	80% medium p	olastic	_					
100901195					_					
2										
3-					_					
-					_					
4-	Same as abo	ve								
5-					-					
6-										
	Harder than a	above			_					
7-					_					
8-										
					_					
9-	Same as abo	ve, dark grayish brown								
10-		an above, wet								
11 –	Saturated				_					
12	Total Depth:	12 feet below ground surface								
13-										
14-	~~~						RMRK3			
	Geo	matrix Consultants		Proj	ect No. 7168	F	Page 1 of 1			

PROJECT: Morton Reading FI					Log of Boring No. B07						
BORIN	G LOC	CATI	ON:	Former Mur	n. Water Supply Field		ELEVATIO Ground 5				
DRILLI	NG C	ТИС	RACTO	R: H.C. N	lutting		DATE STA 10/9/01		(MOL)	DATE FINISH 10/9/01	HED:
DRILLI	NG ME	ETH	OD:	Direct Push			TOTAL DE 12.0	PTH (ft.)	:	MEASURING Ground Su	
ORILLI	NG EC	QUIF	MENT:	Geoprob	e 5400		DEPTH TO WATER) F	IRST	COMPL.	24 HRS.
SAMPL	ING M	1ET	HOD:	Macro Too	I		LOGGED E				
HAMM	ER W	EIGH	HT:	NA	DROP: NA			IBLE PR	OFESSION	AL:	REG. NO
DEPTH (feet)	Sample No.	Sample M	Blows/ S Foot	NAME (U	DESCRIPTION SCS): color, moist, % by wt., plast. cementation, react. w/HCl, geo.	density, structure,			PID READING (ppm)	REMARKS	
<u> </u>	Sar	Sar	B P		Surface Elevation: G	round 556.62 ft. (M	ISL)		RE		
_				Grass ─_ 0 - 10" - blac	k material, burnt odor						
1-	1197	monopolis.		SANDY CLA	Y (CL): dark grayish brown (10Y ~15% fine sand, hard	R 4/2), moist, ~8	5% low				
_	100901197			•							
2-	- [
-											
3-	-										
_											
4-		+		Same as abo	ove, ~90% medium plastic fines,	~10% sand, dark	ξ.	-			
_]			yellowish brown (10YR 4/4)							
5-											
-											
6-	-			Becomes sof	fter, increase sand content						
_								-			
7-											
0]			Soft, wet							
8-											
9-	86										
<i>-</i>	100901198			Gravel/sand	lens at 9' - 9.5'						
10-	=										
-]										
11-	-				N CLAY (CL): dark gray (5Y 4/1) sand, trace gravel, very hard), moist, ~80% lov	w plastic		-		
					•						
12-		_		Total Danill	12 foot holow ground gurfage	53.55					
-				i otai Depth:	12 feet below ground surface						
13-											
4.4								_ -			
14-				Geo	makin Can laa-		Γ	Drein -4 *	lo 7400	1.	RM
				Geo	matrix Consultants			roject i	No. 7168		Page 1 of 1

PROJECT: Morton Reading FI							Log of Boring No. B08					
BORIN	G LOC	CAT	ION:	Former Mun.	Water Supply Field		STOUND 55					
DRILLII	NG CO	ТИС	RACTO	R: H.C. Nu	utting	1	DATE START 10/9/01	ED:		DATE FINIS 10/9/01		
DRILLII	NG MI	ETH	IOD:	Direct Push		1	OTAL DEPT			MEASURIN Ground S	Surface	
DRILLII	NG EC	ווטב	PMENT:	Geoprobe	5400	v	DEPTH TO VATER		FIRST	COMPL.	24 HRS.	
SAMPL	ING N	ИΕТ	HOD:	Macro Tool	T	E	OGGED BY E. Mansell					
HAMMI				NA	DROP: NA		RESPONSIBI M. Heming		ROFESSION	AL: 	REG. NO.	
DEPTH (feet)	Sample No.		Blows/ SA Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. dens cementation, react. w/HCl, geo. inter.				PID READING (ppm)	R	EMARKS	
	Sa	S	<u> </u>	0	Surface Elevation: Groun	nd 557.24 ft. (MS	SL)		<u>~</u>			
				Grass				-				
1-				1 - 1.5': wood	- odor - [railroad tie?]				15.5			
_	199							-				
2-	100901199											
_					(CL): brown (10YR 4/3), moist, ~8	0% low plastic	fines,					
3-				~20% sand, fi	rm							
4												
_				Dark yellowish	n borwn (10YR 4/2)							
5-												
_								-				
6-								-				
_								-				
7-				CLAYEY SAN medium sand,	D (SC): dark yellowish brown (10Y	R 4/2), wet, ~8	30%					
8-				medium sand,	20 % Intes				0.0			
_	100901200											
9-	100											
_				9.5' - 10': sand	d/gravel lens (6")			-				
10-				SANDY LEAN	I CLAY (CL) [TILL]: dark gray (5Y 4	l/2), moist, ~80)% low	$\dashv \dashv$				
				plastic fines, ~	-20% sand, trace gravel, hard							
11-												
12-						~~~						
-				Total Depth: 1	2 feet below ground surface							
13-										-4		
_								$ $				
14-		<u> </u>			·						RMRK3	
				Geom	natrix Consultants		Pr	oject i	No. 7168		Page 1 of 1	

PROJECT: Mort	ton Reading FI		Log of Boring No. B09					
BORING LOCATION	: Former Mun.	Water Supply Field	1	ATION AND nd 559.25				
DRILLING CONTRAC	CTOR: H.C. Nu	tting		STARTED:		DATE FINISI 10/9/01	HED:	
DRILLING METHOD:	Direct Push		TOTAL 12.0	DEPTH (ft.):	MEASURING Ground St		
DRILLING EQUIPME	:NT: Geoprobe	5400	DEPTH WATE	1	FIRST	COMPL.	24 HRS.	
SAMPLING METHOD	D: Macro Tool		LOGG E. Ma	ED BY: ansell				
HAMMER WEIGHT:	NA	DROP: NA	RESPO		ROFESSION	AL:	REG. NO.	
DEPTH (feet) Sample No. Sample Sample Blows/	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. dens cementation, react. w/HCl, geo. inter.	ity, structure,		PID READING (ppm)	RE	MARKS	
S S H	Grass	Surface Elevation: Ground	d 559.25 ft. (MSL)		Œ.			
	CLAYEY SAN	D [FILL]: black		-				
				-				
2 100901201				_				
1008				_				
3-	SILT (ML): gra ~10% fine san	yish brown (10YR 5/2), wet, ~90%	low plastic fines,	_				
	10 /0 11110 3411	u, 301 to 11111		-				
4	SANDY CLAY fines, ~20% sa	(CL): brown (10YR 4/2), dry to mo	ist, ~80% low plasti	ic				
5-	111100, 2070 00	, na, naid		_				
				-				
6-				-				
-								
	More plastic th	an above, firm						
8-	Sama as abov	e, yellowish brown (10YR 5/4), soft	t majet ta wat	-				
-	Same as abov	e, yellowish brown (101K 3/4), son	i, moist to wet	-				
9-				-				
100901202								
1009	01.00=0.00	- (_				
11-	CLAYEY SAN	D (SC): light olive brown (2.5Y 5/3)		-				
	2" gravel at 11			-				
12	11.7' - 12': fine Total Depth: 1:	sand 2 feet below ground surface						
13-								
				_				
14							RMRK3	
	Geom	atrix Consultants	V	Project	No. 7168	F	Page 1 of 1	

PROJECT: Morton Reading FI						Log of Boring No. B10					
BORING L	LOCA	ATION:	Former Mun.	Water Supply Field		Ground 56					
DRILLING	COI	NTRACT	OR: H.C. Nu	utting		DATE START 10/9/01			DATE FIN 10/9/01	ISHED:	
DRILLING	ME	THOD:	Direct Push			TOTAL DEPT	H (ft.):	MEASURI Ground	NG POINT: Surface	
DRILLING	EQI	JIPMEN	T: Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.	
SAMPLIN	G ME	ETHOD:	Macro Tool			LOGGED BY E. Mansell					
HAMMER	WEI	GHT:	NA	DROP: NA		RESPONSIBI M. Heming			IAL:	REG. NO.	
DEPTH (feet)		Sample Blows/ Blows/ Broot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. do cementation, react. w/HCl, geo. in	ensity, structure, ter.			PID READING (ppm)	ı	REMARKS	
ြ	6 (N = =	Grass	Surface Elevation: Gro	ound 561.69 ft, (N	MSL)		<u> </u>			
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 12 - 12 - 12 - 12 - 12			SILT (ML): dai sand, soft, we SANDY CLAY fines, ~20% sates above. Same as above.	r (CL): dark brown (10YR 3/3), m and, hard n brown (10YR 4/6)				0.0			
13-											
14-										RMRK3	
			Geon	natrix Consultants		Pr	oject	No. 7168		Page 1 of 1	

PROJECT: Morton Reading FI				Log of Boring No. DP01					
BORING LOCATION	N: N. of Bldg. 5			EVATION AND round 578.48					
DRILLING CONTRA	ACTOR: H.C. Nu	tting	DA	ATE STARTED: 24/01	(/	DATE FINISH 7/24/01	HED:		
JRILLING METHOD	Direct Push		TC	OTAL DEPTH (ft.):	MEASURING Ground St			
DRILLING EQUIPMI	ENT: Geoprobe	5400	DE		FIRST	COMPL.	24 HRS.		
SAMPLING METHO	DD: Macro Tool		LO	GGED BY:		1			
HAMMER WEIGHT:	: NA	DROP: NA	RE	SPONSIBLE PR . Hemingway		AL:	REG. NO.		
DEPTH (feet) Sample No. No. Sample Blows/		DESCRIPTION CS): color, moist, % by wt., plast. den cementation, react. w/HCl, geo. inter	sity, structure,	. Henningway	PID READING (ppm)	RE	MARKS		
San	3 2		nd 578.48 ft. (MSL)	RE,				
1- 2- 10- 22110p220 3- 4- 5- 6- 7- 8- 8- 10- 11- 12- 12- 12- 12- 12- 12- 12- 12- 12	~20% medium Same as abov	O (SP): dark gray (5Y 4/1), moist, plastic fines, firm			29 220 110				
13-	Sand lens, we	at 13' to 13.5'		-			. 40.		
		y, moist, ~95% medium plastic fin	es, ~5% fine						
14							RMRK3		
	Geom	atrix Consultants		Project	No. 7168	F	Page 1 of 2		

Morton Reading FI Log of Boring No. DP01 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. sand, firm 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 RMRK3 Page 2 of 2 **Geomatrix Consultants** Project No. 7168

DRILLING CONTRACTOR: H.C. Nutting 7/24/01 7/24 PRILLING METHOD: Direct Push TOTAL DEPTH (ft.): MEAS	SURING POINT: und Surface
DRILLING CONTRACTOR: H.C. Nutting DATE STARTED: 7/24/01 DATE TARTED: 7/24/01 DATE STARTED: 7/24/01 DATE S	4/01 SURING POINT: und Surface
DRILLING METHOD: Direct Push 15.0 Groupe State S	und Surface
DEPTH TO FIRST COM	
- I WATER I	
SAMPLING METHOD: Macro Tool LOGGED BY: E. Mansell	
HAMMER WEIGHT: NA DROP: NA RESPONSIBLE PROFESSIONAL: M. Hemingway	REG. NO.
SAMPLES DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Flavoties: Crowd F77 09 ft (MSL)	REMARKS
Surface Elevation: Ground 577.99 It. (MSL)	
GRAVEL/FILL	
1-	
2 - CLAYEY SAND (SP): dark gray (5Y 4/1), moist, ~80% medium plastic	
Tines, ~20% fine sand, firm	
4-	
5 - Dark brown discoloration at 5' to 5.5'	
<u></u>	
8-	
9- 12	
0.002401125	
10 SANDY CLAY (CL):	
12-	
CLAYEY SAND (SP); dark gray, wet	
SANDY CLAY (CL): grayish brown, ~95% high plastic fines,	
Geomatrix Consultants Project No. 7168	Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP02 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION

NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. DEPTH (feet) REMARKS Sample No. Sample Blows/ Foot ~5% sand, firm 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJE	CT:	N	/lorton	Reading FI				Log	of Bori	ng No. I	DP03
BORIN	G LOC	CATI	ION:	E. of Bldg. 1			ELEVATION Ground		DATUM: ft. (MSL)		
DRILLII	NG CC	TNC	RACTO	R: H.C. Nu	tting		DATE ST/ 7/24/01	ARTED:		DATE FINIS 7/24/01	HED:
RILLII	NG ME	ETH	OD:	Direct Push			TOTAL DE	EPTH (ft.)	:	MEASURIN Ground S	
DRILLII	NG EC	QUIF	PMENT:	Geoprobe	5400		DEPTH TO WATER	O F	FIRST	COMPL.	24 HRS.
SAMPL	ING M	1ETI	HOD:	Macro Tool			LOGGED E. Mans				
НАММ	ER WE	EIGI	HT:	NA	DROP: NA			SIBLE PR	OFESSION	AL:	REG. NO.
DEPTH (feet)	Sample No.	Sample M	Blows/ S Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. c cementation, react. w/HCl, geo. ir	y wt., plast. density, structure, w/HCI, geo. inter.			PID READING (ppm)	RI	EMARKS
	0,	Ţ		GRAVEL/FILL	Surface Elevation: Gr	ound 568.60 ft. (N	/ISL)				
1- -	SANDY CLAY (CL): yellowish brown, moist, ~80% low plastic fines,										
_	SANDY CLAY (CL): yellowish brown, moist, ~80% low plastic fine case of the cas								0.0		
3-				3 3 3 3 3 3 3 3 3 3							
4-		+							0.0		
5-				Harder than at	pove, increase in gravel content						
6-									0.0		
7-							٠				
8-				POORLY GRA ~10% fines, tra	ADED SAND (SP): brown, moist ace gravel	, ~90% medium	sand,				
9-	072401127										
10-		1		Increase in gra	avel content (1" - 2")						
11-		\bigvee									
12- -		<u>/ \</u> 		SANDY CLAY sand and grav	(CL): light brown, ~90% mediu	m plastic fines,	~10%				
13- -				POORLY GRAsand, ~5% gra	ADED SAND (SP): light brown, i	moist, ~95% me	dium				
14-				~~~							RMRK3
				Geom	atrix Consultants			Project N	No. 7168		Page 1 of 2

PROJECT: Morton Reading FI Log of Boring No. DP03 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26 27 28-29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morton	Reading FI			Log	of Bori	ng No. D	P04
BORING LOCATION:	W. of Bldg. 6			ON AND DA 574.27 ft			
DRILLING CONTRACTO	R: H.C. Nu	tting	DATE ST/ 7/24/01		(WOL)	DATE FINISH 7/24/01	HED:
PRILLING METHOD:	Direct Push			EPTH (ft.):	-	MEASURING Ground Su	
DRILLING EQUIPMENT:	Geoprobe	5400	DEPTH TO	O FI	RST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tool		LOGGED E. Mans				
HAMMER WEIGHT:	NA	DROP: NA		SIBLE PRO	FESSION	AL:	REG. NO.
Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter. Surface Elevation: Ground			PID READING (ppm)	RE	MARKS
1- 2- 3- 4- 5-	ASPHALT/FIL			-	0.0		
6- - 7-		CLAY (CL) [TILL]: dark gray, moist, es, ~15% sand, trace gravel, soft to		-	0.0		
8-	Harder than at						
9-							
10-	Reddish browr	1			0.0		
11-	Gray lens at 1	1', less gravel					
12-	Sand/gravel le	ns, wet at 12' to 12.5'					
13-							
14							RMRK3
	Geom	atrix Consultants		Project No	o. 7168	F	Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP04 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. SANDY LEAN CLAY (CL) CONTINUED 15 1/2" gray lens at 15' 16 Softer than above, wet 17 CLAYEY SILT (ML): gray, moist, ~95% low plastic fines, ~5% fine sand, soft to firm 18 19 20 CLAY (CL): dark gray, ~100% high plasticity fines, wet, soft 21 22 Hole swelled shut 19' bgs, bentonite up to surface 23 24 Total Depth: 24 feet below ground surface 25 26 27 28 29 30

31

PROJE	CT:	N	/lortor	Reading FI			L	og	of Bori	ng No. D	P05
BORIN	G LO	CAT	ION:	N. of E. Tank	Farm		ELEVATION A				
DRILLI	NG C	ОИТ	RACTO	DR: H.C. Nu	utting		DATE START 7/25/01		(DATE FINISH 7/25/01	IED:
RILLI¢	NG M	ETH	OD:	Direct Push			TOTAL DEPT 15.0	H (ft.)):	MEASURING Ground Su	
DRILLI	NG E	QUIF	PMENT	: Geoprobe	5400		DEPTH TO WATER	F	FIRST	COMPL.	24 HRS.
SAMPL	ING N	ИЕТ	HOD:	Macro Tool			LOGGED BY: E. Mansell				
НАММ	ER W	EIG	HT:	NA	DROP: NA		RESPONSIBLE M. Heming		ROFESSION	AL:	REG. NO.
DEPTH (feet)	Sample No.	e	Blows/ S Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	er.			PID READING (ppm)	REM	MARKS
	0,			GRAVEL/FILL		und 578.64 ft. (N	MSL)				
- 	1130							-			
1-	072401130				(CL): yellowish brown, moist, ~8	10% low plastic	fines,				
2-								-			
-								-			
3-									0.0		
4-				More plastic th							
_				Few dark brow	n (1/8") laminations, no odor at s	5.8' to 6.0'		-			
5-								-			
-								-			
6-					CLAY (CL) [TILL]: olive brown, r		gh		0.0		
7-				plastic fines, ~	10% fine gravel, trace sand, soft						
-								-			
8-	_							-			
-	072401131							-			
9-	70								0.0		
10-	_			Hard							
-											
11-				1" Light gray le	ens						
40											
12- -									0.0		
13-				D-street 1	malant massal for the control of	<i>E</i> '					
-				рагк gray, авс	undant gravel, fossils at 13' to 13	.5		-			
14-											RMRK3
				Geom	natrix Consultants		Pre	oject I	No. 7168	P	age 1 of 2

Morton Reading FI Log of Boring No. DP05 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 2" light brown sand seam at 14' 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Mortor	n Reading FI			Log	of Bor	ing No. D	P06
BORING LOCATION:	N.W. fo Bldg	. 7	ELEVATI				
DRILLING CONTRACTO			DATE ST 7/25/01	ARTED:	ft. (MSL)	DATE FINISH 7/25/01	HED:
RILLING METHOD:	Direct Push		TOTAL D 25.0):	MEASURING Ground St	
DRILLING EQUIPMENT	: Geoprobe	5400	DEPTH T WATER	0 1	FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tool		LOGGED E. Mans				
HAMMER WEIGHT:	NA	DROP: NA	RESPON M. Hem		OFESSION	IAL:	REG. NO.
(feet) Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. densi cementation, react. w/HCl, geo. inter.	ty, structure,		PID READING (ppm)	RE	MARKS
N N III	GRASS/FILL I		l 575.65 ft. (MSL)		IL.		
	Few roots	V/ (1 = 1 \					
1-		(CL) [FILL]: yellowish red (5YR 4/6) 30% medium sand, moist, soft to fin					
2-	·			_			
				-			
3-					0.0		
		,		-			
4-							
5-							
	Few roots at 5	' to 6'					
6-	SANDY CLAY	(CL) [TILL]: yellowish brown (10YR		-	0.0		
-		c fines, ~20% fine sand, trace grave		-			
7-	Increase in gra	avel content					
8-							
				-			
9-				-	0.0		
-				-			
10-							
12-							
	Same as abov	re					
13-							
_							
14	~~~	·					RMRK3
/	Geon	natrix Consultants		Project I	No. 7168	F	age 1 of 2

PROJECT: Morton Reading FI

Log of Boring No. DP06 (cont'd)

SAMPLE		DESCRIPTION		g Z	F	REMARKS
(feet) Sample No. Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		PID READING (ppm)	' 	
		SANDY CLAY (CL) [TILL]: CONTINUED		0.0		
7						
5						
-		Dark gray (5Y 4/1) at 15.5'				
6-			-		Start dual	tube method at 1
-					bgs	
7-		LEAN CLAY (CL): gray (10YR 5/1), moist to wet, ~90% medium	- -			
-		plastic fines, ~10% fine sand, hard	1 +			
8-		1" Piece of wood at 17.2'		0.0		
-		CLAYEY SAND (SC): gray (10YR 5/1), wet, ~80% fine sand, ~20%	- -			
9-		low plastic fines				
-	-	SANDY CLAY (CL): gray (10YR 5/1), wet, ~80% low plastic fines,	- -			
o-		~20% sand, soft	1-1	0.0		
-		Same as above, abundant black laminations No odor at 20' to 21'	14			
1-		Silty sand seam, wet at 21' to 21.3'	14			
-		CLAY (CL): dark gray (5Y 4/1), moist, ~100% high plastic fines, soft to	-			
2-		firm, homogeneous				
_						
3-						
4-						
5-						
		Total Depth: 25 feet below ground surface				
6-						
7-						
.]						
8-						
9-						
9						
60 –						
1						
1						RMRK
-	17	Geomatrix Consultants	Project N	No. 7168		Page 2 of 2

PROJECT: Mortor	n Reading FI			L	.og	of Bori	ing No. I	DP07
BORING LOCATION:	Sewer Bldg.	 19		ELEVATION Ground 57				
DRILLING CONTRACTO	OR: H.C. Nu	tting		DATE STAR 7/26/01		it. (MSL)	DATE FINIS 7/26/01	SHED:
RILLING METHOD:	Direct Push			TOTAL DEPT	ΓΗ (ft.):	MEASURIN Ground S	
DRILLING EQUIPMENT	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tool			LOGGED BY				
HAMMER WEIGHT:	NA	DROP: NA		RESPONSIB M. Heming	LE PF		AL:	REG. NO.
(feet) Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. ir	ensity, structure,		,way	PID READING (ppm)	RI	EMARKS
DEPT (feet Sample No. Sample Blows/ Foot			ound 573.13 ft. (N	MSL)		RE/		_
	GRASS/FILL			-		,		
1-							PID nonfun	ctional
2-					-			
					-			
3-	SANDY CLAY	(CL): yellowish brown (10YR 5	/// moist ~70%		- -			
		30% sand/gravel, firm to hard	4), moist, ~707	o iOw	-			
4-					-			
-					-			
5-					-			
					-			
6-								
_					-			
/-	Wood material	at 7'						
8-								
	Same as abov	e, wet						
072601132								
0726					-			
10-	T. 15 (1.4				4-			
	rotal Depth: 1	0 feet below ground surface						
11-								
-								
12-					-			
-								
13-								- 90,
14	////~							RMRK3
	Geom	atrix Consultants		Pr	oject	No. 7168		Page 1 of 1

PROJECT: Mortor	n Reading FI		l	₋og of Bori	ng No. [P08
BORING LOCATION:	W. of Bldg.	27 (Sewer)	1	AND DATUM: 69.93 ft. (MSL)		
DRILLING CONTRACTO	DR: H.C. N	lutting	DATE STAR 7/26/01		DATE FINIS 7/26/01	HED:
DRILLING METHOD:	Direct Push		TOTAL DEP 12.0	TH (ft.):	MEASURING Ground Si	
DRILLING EQUIPMENT	: Geoprobe	e 5400	DEPTH TO WATER	FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Too	l	LOGGED BY			
HAMMER WEIGHT:	NA	DROP: NA		BLE PROFESSION	AL:	REG. NO.
CEPTH (feet) Sample No. Sample Sample Sample Foot	NAME (U	DESCRIPTION SCS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter.	/, structure,	PID READING (ppm)	RE	MARKS
Sa Sa B			569.93 ft. (MSL)	<u> </u>		
	GRASS/FILL					
1- \ \						
- \/						
2-						
3- /						
4	Same as abo	ove - sand gravel/fill				
						ı
5-		Y (CL): dark grayish brown, moist to w				
9 072601133	slight odor,	~15% sand, trace gravel, black materi	ar throughout,			
072601						
7-						
8-						
9-						
10-						
48	Some black r	material, no odor				
11 - 072601134		,				
	CLAY (CL): v	very dark gray, moist, ~100% medium	plastic fines, trace	- -		
12		nomogeneous 12 feet below ground surface				
		0				
13-						ı
14	∕⁄ © Geo	matrix Canaultanta		roject No. 7460	Τ.	RMRK3
	Geo	matrix Consultants	P	roject No. 7168		Page 1 of 1

PROJECT: Morton F	Reading FI			L	og	of Bori	ng No. [P09
BORING LOCATION:	W. of Bldg 3	0	-	Ground 55				
DRILLING CONTRACTOR	R: H.C. No	utting		DATE START 7/27/01			DATE FINIS 7/27/01	HED:
JRILLING METHOD:	Direct Push			TOTAL DEPT	H (ft.)):	MEASURING POINT: Ground Surface	
DRILLING EQUIPMENT:	Geoprobe	5400		DEPTH TO WATER	F	FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tool			LOGGED BY: E. Mansell				
HAMMER WEIGHT:	NA	DROP: NA		RESPONSIBLE M. Heming		ROFESSION	AL:	REG. NO.
Cfeet) Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION IAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: Ground 553.87 ft. (MSL) CRETE/FILL				PID READING (ppm)	RE	MARKS
1 2-		′ (CL) [FILL]: dark brown, moist	, ~70% low plast	ic fines,	_			
3-						0.0		
4- - 5-					_			
6-	Gravel, 3" thic	k						
7- 8-	CLAY (CL): data	ark gray (5Y 4/1), moist, ~100% omogeneous	high plasticity fi	nes,	_			
9-		ADED SAND (SP): dark brown, /el, ~10% low plastic fines	wet, ~90% med	ium				
10-	Black materia	I at 10' to 12'				23.0		
12-02220	Total Depth: 1	2 feet below ground surface						
13-					_			RMRK3
1	Geon	natrix Consultants		Pro	oject I	No. 7168		Page 1 of 1

PROJE	CT:	M	lorton F	Reading FI			L	og	of Bori	ng No.	DP10
BORING	G LOC	ATI	ON:	E. of Bldg. 30)		Ground 55				
DRILLI	NG CC	NTI	RACTOR	: H.C. Nu	itting		DATE START 7/27/01		(=)	DATE FINIS 7/27/01	SHED:
DRILLI	NG ME	TH	OD:	Direct Push			TOTAL DEPT 15.0			MEASURIN Ground S	Surface
DRILLI	NG EQ	UIP	MENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL. 24 HRS.	
SAMPL	ING M	ETH	HOD:	Macro Tool			LOGGED BY: E. Mansell				
HAMM				NA	DROP: NA		RESPONSIBL M. Heming		ROFESSION	AL:	REG. NO.
DEPTH (feet)	Sample No.		Blows/ G	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. of cementation, react. w/HCl, geo. is				PID READING (ppm)	R	EMARKS
	S _	Sa	<u> </u>	CONCDETE/E		round 553.59 ft. (N	MSL)		<u> </u>		
_				CONCRETE/F	ILL			-			
1-								-			
2-	CLAYEY SAND (SC): very dark grayish brown (2.5Y 3/2), moist, ~80% medium sand/gravel, ~20% fines, soft, odor										
	07.							-			
3-		\bigvee									
4-		\prod									
5-				Black discolora	ation, strong odor at 5' to 15'			-			1
_											
6-											
7-		7									
 8-		\bigvee									
_											
9-	072701138										
10-											
- 10	36 BLIN			Same as abov	е						
11-	072701136 BLIND										
12-		X									
											j -1
13-											ı
14-											RMRK3
			17.	Geom	natrix Consultants		Pro	oject	No. 7168		Page 1 of 2

PROJE	CI:	IV	nortoi	r Reading Fi	Log of Boring	No. DP10 (co	ont'd)
DEPTH (feet)	Sample No.	Sample	Blows/ S	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, s cementation, react. w/HCl, geo. inter.	tructure,	PID READING (ppm)	REMARKS
-				SANDY LEAN CLAY (CL) [TILL]: black, wet, ~80% m fines, ~20% medium sand, trace gravel, strong odor	edium plastic		
15-				Total Depth: 15 feet below ground surface	-		
16- -							
17 -							
18 <i>-</i> -							
19 -							
20 - -							
21 - -							
22 <i>-</i> -							
23 - -							
24 - -							
25 - -							
26 - -							
27 - -							
28 - -							
29 – –							
30 - -							·····
31-		L	I			I	RMRK3
			•	Geomatrix Consultants	Project No.	o. 7168	Page 2 of 2

PROJECT: Morton Reading FI						Log of Boring No. DP11					
BORING L	OCA	TION:	E. of Bldg. 5		1	ELEVATION Ground 5					
DRILLING	CON	ITRAC	ctor: H.C. Nu	tting		DATE STAR 7/28/01	RTED:		7/28/01		
DRILLING	MET	HOD:	Direct Push			TOTAL DEP 24.0	PTH (ft.):		MEASURIN Ground S		
DRILLING	EQL	JIPMEI	NT: Geoprobe	5400	1	DEPTH TO WATER	F	IRST	COMPL.	24 HRS.	
SAMPLING	G ME	THOD	: Macro Tool			LOGGED B' E. Manse					
HAMMER	WEI	GHT:	NA	DROP: NA		RESPONSIE M. Hemin		OFESSION	IAL:	REG. NO.	
-	SAM	Blows/ Blows	NAME (US	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.				PID READING (ppm)	R	EMARKS	
w w	C	о <u>ш</u>	CONCRETE/F	Surface Elevation: Ground 574	4.04 ft. (M	ISL)		ır.			
_		Н	Sand/gravel ba						PID nonfur	ctional	
1-											
2-				(CL) [FILL]: dark yellowish brown (10Y) plastic fines, ~20% sand, soft	R 3/4), n	noist,					
3-											
-											
4											
5-										1	
			moist, ~80% m	CLAY (CL) [TILL]: dark yellowish brown nedium to high plastic fines, ~20% medi							
6-			fine gravel, firm Olive gray (5Y								
_				,							
7-											
8											
9-			Silt lens at 8.8'				_				
_			CLAY (CL): oli sand, firm	ve (5Y 4/3), moist, ~95% high plastic fir	nes, ~5%	fine					
10-											
- 11-			1" Sand lens a	t 10.5', wet							
_			SILTY SAND (SM): olive (5Y 4/3), wet, ~80% fine san			_				
12-			plastic fines	om, onve (or 4/0), well, "ou /o line san	iu, 20/0	, IOW					
40											
13-										1	
14											
			Geom	atrix Consultants		P	Project N	lo. 7168		Page 1 of 2	

PROJE	CT: Morton	Reading FI	Log of Bor	ring No. D	P11 (cont'd)
UEPTH (feet)	Sample No. Sample Blows/ Sample Foot	DESCRIPTION		PID READING (ppm)	REMARKS
		SILTY SAND (SM) CONTINUED			
15-					
16-					
17-		CLAY (CL): dark gray (5Y 4/1), moist, ~100%	high plastic fines, trace		
18-		fine sand, soft, homogeneous			
19-		Same as above, no sand			
20-					
21-					
22-		Same as above, very soft			
23-					
25-		Total Depth: 24 feet below ground surface			
26-					
27-				-	
28-					
29-					
30-					
31-					RMRK3
Geomatrix Consultants Project No. 7168 Page 2 of 2					

PROJECT: Morton	Reading FI	Log of Bori	ng No. DP12
BORING LOCATION:	N. of Tank Farm (N. End)	ELEVATION AND DATUM: Ground 569.99 ft. (MSL)	
DRILLING CONTRACTO	R: H.C. Nutting	DATE STARTED: 7/28/01	DATE FINISHED: 7/28/01
DRILLING METHOD:	Direct Push	TOTAL DEPTH (ft.): 20.0	MEASURING POINT: Ground Surface
DRILLING EQUIPMENT:	Geoprobe 5400	DEPTH TO FIRST WATER	COMPL. 24 HRS.
SAMPLING METHOD:	Macro Tool	LOGGED BY: E. Mansell	
HAMMER WEIGHT:	NA DROP: NA	M. Hemingway	AL: REG. NO. NA
DEPTH (feet) Sample No. PS Sample Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, stru cementation, react. w/HCl, geo. inter.	cture, BID BID CHARLE (MAN)	REMARKS
_ % % m	Surface Elevation: Ground 569.9 ASPHALT/BASE MATERIAL	9 ft. (MSL)	
1 - 00 1	SANDY CLAY (CL): dark yellowish brown (10YR 3/4), m high plastic fines, ~20% sand, trace gravel, soft to firm Same as above, wet Medium gravel lens at 9.8' to 10.2'	- - - - - -	PID not functioning properly
11-	CLAYEY SAND (SC): dark yellowish brown (10YR 3/4), sand/gravel, ~40% medium plastic fines, firm	wet, ~60%	
12-		0.0	.~.
13-	SANDY LEAN CLAY (CL) [TILL]: yellowish brown (10YF ~80% medium plastic fines, ~20% medium sand, trace ghard		PID reading moves up very slowly
	Geomatrix Consultants	Project No. 7168	Page 1 of 2

Morton Reading FI Log of Boring No. DP12 (cont'd) SAMPLES PID READING (ppm) UEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. Quartz-like hard material at 14' to 14.1' PID recalibrated SANDY LEAN CLAY (CL) [TILL]: continued 15 16 CLAYEY SAND (SC) [TILL]: dark yellowish brown (10YR 4/4), damp to dry, ~60% medium sand, ~20% low plastic fines, ~20% gravel 17 0.0 18 SANDY CLAY (CL) [TILL]: 19 20 Total Depth: 20 feet below ground surface 21 22 23 24 25 26 27 28 29 30 31 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT:

PROJECT: Mortor	n Reading FI			Log	of Bori	ng No.	DP13
BORING LOCATION:	W. of Buildir	ng 16	Ground		DATUM: ft. (MSL)		
DRILLING CONTRACT	OR: H.C. N	utting	7/28/01	ARTED:		DATE FIN 7/29/01	· '
DRILLING METHOD:	Direct Push		15.0	EPTH (ft.)):	MEASURI Ground	NG POINT: Surface
DRILLING EQUIPMENT	Γ: Geoprobe	÷ 5400	DEPTH TO WATER	0	FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tool		LOGGED E. Mans				
HAMMER WEIGHT:	NA	DROP: NA		SIBLE PR	ROFESSION	AL:	REG. NO.
HTGES SAMPLES (feet) 1	SANDY CLAY low plastic fin (1" to 2"), ~30	DESCRIPTION 6CS): color, moist, % by wt., plast. density, structure cementation, react. w/HCl, geo. inter. Surface Elevation: Ground 556.04 ft. C(CL) [FILL]: very dark brown (10YR 2/2), moies, ~30% sand, soft, black material at 3' GRAVEL (GC) [FILL]: yellow (10YR 7/6), ~70% low plastic fines, odor ND (SC): dark brown, wet, ~80% medium sand es, trace fine gravel, putrid odor, sour	st, ~70%		PID O.0 Standard of Reading (ppm)	PID recalit	prated
9- 10- 11-002500 12- 13-	SANDY LEAN	ration at 11.5' to 13.5' N CLAY (CL) [TILL]: dark gray (5Y 4/1), moist, astic fines, ~20% sand trace gravel, hard	~80% low	-	125		
14							RMRK3
•	⊘ Geor	natrix Consultants		Project I	No. 7168		Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP13 (cont'd) SAMPLES PID READING (ppm) UEPTH (feet) REMARKS DESCRIPTION Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [TILL]: continued 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26-27 28 29 30 RMRK3 //X Page 2 of 2 **Geomatrix Consultants** Project No. 7168

PROJECT: Morton F	Reading FI			Log	of Bori	ing No. E)P14
ORING LOCATION:	W. of Bldg	. 16 (W. of DP13)		TION AND	DATUM: 2 ft. (MSL)		
PRILLING CONTRACTOR	R: H.C.	Nutting	7/29/0	STARTED: 01		DATE FINISI 7/29/01	HED:
RILLING METHOD:	Direct Pus	h	TOTAL 15.0	DEPTH (ft	.):	MEASURING Ground St	
PRILLING EQUIPMENT:	Geoprol	be 5400	DEPTH WATE		FIRST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro To	ol	LOGG E. Ma	ED BY:			
HAMMER WEIGHT:	NA	DROP: NA	RESPO		ROFESSION	IAL:	REG. NO.
Sample No. Sample Blows/ Foot	NAME (DESCRIPTION USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	ensity, structure,		PID READING (ppm)	RE	MARKS
Sa Sa			und 556.12 ft. (MSL)		2		
_	CONCRET	E/FILL		-			
1-	SANDY CL fines, ~20%	AY (CL) [FILL]: dark gray (5Y 4/1), r soft to firm	moist, ~80% low plast	ic -	0.0		
3-041106220	 	-	37.9				
5-6-		2" gravel, ~40% low plastic fines	,, . ,	-			
8-	Black mater	rial		-	82.8		
9 - 1 0 - 7411047	sand, ~20%	AND (SC): olive gray (5Y 4/2), mois low plastic fines, trace gravel rial at 9.5' to 10.5'	t to wet, ~80% mediu		10.2		
11-	Black mate	rial at 12' to 14.5', strong odor		- - -	15.9		
-				-	-		
14		···········					RMF
17	Ge	omatrix Consultants		Project	No. 7168	F	Page 1 of 2

PROJE	CT:	N	1ortor	n Reading FI	Log of Bo	rinç	g No. D	P14 (co	ont'd)
DEPTH (feet)	Sample No.	Sample M	Blows/ CO Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. in	ensity, structure, ter.		PID READING (ppm)		REMARKS
15-				SANDY LEAN CLAY (CL) [TILL]: dark gray (5) to medium plastic fines, ~20% sand trace grav	7 4/1), moist, ~80% low el, hard				
16- -				Total Depth: 15 feet below ground surface					
17-									
18- - 19-						-			
20-						-			
21-						_			
23-						-			
24-	-					-			
25- - 26-						- - -			
- 27 - -						-			
28-		00000				_			
29 - - 30 -	-								
31-									RMRK3
			•	Geomatrix Consultants	Pro	oject I	No. 7168		Page 2 of 2

PROJE	CT:	M	lorton l	Reading FI				Log	of Bor	ing No. D	P15
BORIN	G LOC	ATI	ON:	N. of W. Tani	r Farm		ELEVATION Ground		DATUM: 8 ft. (MSL)	1	
DRILLII	NG CC	NTI	RACTOR	R: H.C. Nu	tting		DATE ST/ 7/29/01		, ,	7/29/01	
DRILLII	NG ME	TH	OD:	Direct Push			TOTAL DI 15.0		.):	MEASURING Ground Su	
DRILLII	NG EC	UIP	MENT:	Geoprobe	5400		DEPTH TO WATER	0	FIRST	COMPL.	24 HRS.
SAMPL	ING M	ETH	HOD:	Macro Tool			LOGGED E. Mans	ell			
HAMMI	ER WE	IGF	łT:	NA	DROP: NA		RESPON: M. Hem		ROFESSION	NAL:	REG. NO.
DEPTH (feet)		Sample N	Blows/ Sa Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt. cementation, react. w/HC	, plast. density, structure,			PID READING (ppm)	RE	MARKS
	S	S	ш	CONCRETE/F	Surface Elevation:	Ground 554.48 ft. (N	MSL)		<u> </u>		
1- - 2-	072901148							-		This boring h	narder to drive nd DP14
3-	0				RAVEL (GC): yellowish ravel, ~40% low plastic		to moist,	_ -			
4-		\bigcap						-			
5-				CANDY CLAY	(01)	7501	50/				
6-		$\backslash /$		sand, firm, odd	(CL): dark gray, moist, -	~75% low plastic fines,	~5%	-	23		
7 -		$\left \right $						-			
8-	1149	V		CLAYEY SAN wet, odor	D (SC): dark gray, ~80%	medium sand, ~20% f	ines,				
9-	072901149							-	36		
10-				Black material	at 9.5' to 15'			-			
11-								-			
12- -								-	15		
13 <i>-</i>				Strong odor				-			,
14-											RMRK3
			17	Geom	atrix Consultants			Project	No. 7168	F	Page 1 of 2

Log of Boring No. DP15 (cont'd) SAMPLES PID READING (ppm) UEРТН (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 15-Total Depth: 15 feet below ground surface 16-17 18-19 20 21 22 23-24 25 26 27-28 29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT:

Morton Reading FI

ROJECT: Morto	on Reading FI		Log of Borin	g No. DP16			
ORING LOCATION:	N. of W. Tank Farm	ELEVATION 554.48 ft.	N AND DATUM: . (MSL				
RILLING CONTRAC	TOR: H.C. Nutting	DATE STAI 7/30/01	RTED:	DATE FINISHED: 7/30/01			
RILLING METHOD:	Direct Push	15.0					
RILLING EQUIPMEN	IT: Geoprobe 5400	DEPTH TO WATER	FIRST	COMPL. 24 HRS.			
AMPLING METHOD:	Macro Tool	LOGGED B E. Manse					
AMMER WEIGHT:	NA DROP: NA		IBLE PROFESSIONAL	REG. NO.			
(feet) Sample No. Sample Blows/	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, ge	st. density, structure,	PID READING (ppm)	REMARKS			
Sa Sa n	Surface Elevation:	554.48 ft. (MSL	<u> </u>				
1-	CONCRETE SANDY CLAY [FILL]		- - -				
2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	WELL GRADED SAND (SW): brown (10Y trace fines	R 4/3), wet, ~100% sand,					
3- 6			12				
4-							
5-							
6-			14.2				
7-	Black staining at 7' to 13.5', odor		-				
8-	Same as above, strong odor						
9-			9.0				
10-							
11-							
12 - 151100570	Same as above, very strong organic odor,	some gravel	421				
-	SANDY LEAN CLAY (CL) [TILL]: dark gra to medium plasticity fines, ~20% sand trac						
14				RMRK			
	Geomatrix Consultants		Project No. 7168	Page 1 of 2			

PROJE	ECT: Mortor	n Reading FI	Log of Boring	g No. DP16 (d	cont'd)
UEPTH (feet)	Sample No. Sample Sample Blows/ Sample Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. in	ensity, structure, ter.	PID READING (ppm)	REMARKS
_				LE .	
15-		Total Depth: 15 feet below ground surface			
16-					
17-			-		
18-	_		-		
_			. -		
19-			-		
20-	-		-		
21-			-		
22-					
23-			-		
24-	-		-		
25-			-		
_	_		-		
26-			-		
27-	-		-		
28-]		-		
29-			-		
30-			-		
			-		
		Geomatrix Consultants	Project	No. 7168	Page 2 of 2

PROJE	CT:	Mortor	n Reading FI			L	.og	of Bori	ng No. D	P17
BORING	3 LOC	ATION:	N. of W. Tan	k Farm		ELEVATION 554.61 ft. (
DRILLI	NG CO	NTRACT	OR: H.C. Nu	utting		DATE STAR 7/30/01	TED:		7/30/01	,
DRILLIN	NG ME	THOD:	Direct Push			TOTAL DEPT			MEASURING Ground Su	rface
DRILLIN	NG EQ	UIPMENT	Geoprobe	5400		DEPTH TO WATER		TIRST	COMPL.	24 HRS.
SAMPL	ING M	ETHOD:	Macro Tool			LOGGED BY E. Mansell				
HAMME	ER WE	IGHT:	NA	DROP: NA		RESPONSIB M. Heming		OFESSION	AL:	REG. NO.
H1da() 1- 2-		Sample Blows/ Foot	CONCRETE/E	CS): color, moist, % by wt., plast. cementation, react. w/HCl, geo. i Surface Elevation: 58 BASE MATERIAL (CL) [FILL]: very dark gray (2.8 c fines, ~20% sand, trace grave	54.61 ft. (MSL) 5Y 3/1), wet, ~80	0%		PID READING (ppm)		MARKS
3-	073001152		Dark brown st	aining				0.0		
4 – –			Some gravel a	at 4'						
5- -										
6- -								0.0		,
7- - 8-	<u> </u>						-			
9-				ADED SAND with CLAY (SC): t ~20% low plastic fines, trace g				1.7		
10-			10' to 14'	2070 low plastic files, trace g	graver, black iilal	oriai at				
11- -										
12- -	53	V						120		
13-	073001153									l
14-			SANDY LEAN	CLAY (CL) [TILL]: dark gray (5Y 4/1), moist,					
			Geom	natrix Consultants		Pr	oject N	No. 7168	P	rmrk3

Morton Reading FI PROJECT: Log of Boring No. DP17 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) REMARKS **DESCRIPTION** Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. ~80% low to medium plastic fines, ~20% sand trace gravel, hard 15 16 Total Depth: 16 feet below ground surface 17 18 19 20 21 22 23-24 25 26 27 28 29-30-31 RMRK3 //X **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJEC	CT:	M	lorton	Reading FI			L	_og	of Bor	ing No.	DP18
BORING	LOC	ATI	ON:	N. of Bldg. 40	(Geophys. G)		ELEVATION 555.42 ft.				
DRILLIN	G CO	NTF	RACTO	PR: H.C. Nu	tting		DATE STAR 7/30/01	TED:		7/30/01	
DRILLIN	G ME	THO	OD:	Direct Push			TOTAL DEP			MEASURIN Ground S	
DRILLIN	G EQ	UIP	MENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPLI	NG M	ETH	HOD:	Macro Tool			LOGGED BY E. Mansel	<u> </u>			
HAMME	R WE	IGH	IT:	NA	DROP: NA		RESPONSIE M. Heming			IAL:	REG. NO.
DEPTH (feet)	Sample No.		Blows/ G Foot	NAME (USC	DESCRIPTION CS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.	tructure,			PID READING (ppm)	R	EMARKS
	Š	Š	<u> </u>	ASPHALT - 12	Surface Elevation: 555.42 ft. (N	MSL)			<u> </u>		
1-				GRAVEL/BASI				-			
-	1154							-			
2-	073001154				(CL) [FILL]: very dark grayish brown (2 tic fines, ~25% sand, trace gravel, firm	.5Y 3/2)), moist,	-			
3-								-	0.0		
4-				Same as above	e, brown (10YR 4/3), no gravel			-			
5-								-			
6-									0.0		
7-								-			
8-								-			
-								_			
9-				3				-	0.0		
10-				WELL GRADE	D SAND (SW):						
11-				SILT (ML):				-			
- 12-				WELL GRADE trace fines, trace	D SAND (SW): olive brown (2.5Y 4/4), ce fine gravel	~100%	sand,] -	0.0		
- 13- -				Becomes more	e coarse with depth, wet			-			; 4
14											RMRK3
			1.	Geom	atrix Consultants		Р	roject	No. 7168		Page 1 of 2

Morton Reading FI Log of Boring No. DP18 (cont'd) SAMPLES DEPTH (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 073001155 15 Total Depth: 15 feet below ground surface 16 17 18-19 20 21 22 23 24 25 26 27 28-29-30 RMRK3 /X **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT:

PROJE	CT:	M	lorton	Reading FI			Le	og	of Bori	ng No. I	DP19
BORIN	G LOC	ATI	ON:	N. of Bldg. 40) (Geophys. F)		ELEVATION A 555.53 ft. (N				
DRILLI	NG CC	NTI	RACTO	R: H.C. Nu	itting		7/30/01	ED:		7/30/01	
DRILLI	NG ME	THO	OD:	Direct Push			TOTAL DEPTH			MEASURIN Ground S	
DRILLI	NG EQ	UIP	MENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPL	ING M	ETH	HOD:	Macro Tool			LOGGED BY: E. Mansell				
HAMM	ER WE	IGH	IT:	NA	DROP: NA		RESPONSIBL M. Hemingv		ROFESSION.	AL:	REG. NO.
DEPTH (feet)	Sample No.		Blows/ G Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. dens cementation, react. w/HCl, geo. inter. Surface Elevation: 555.53	sity, structure,			PID READING (ppm)	RI	EMARKS
- 1-				ASPHALT - 12 Gravel base							
2-	073001156				(CL): very dark gray (2.5Y 3/1), moc, ~20% sand, soft to firm	oist, ~80% fi	ines,				
3-									0.0		
4-											
5-				Dark grayish b	rown (2.5Y 4/2), firm to hard						
6- -									0.0		
7 - -											
8-											
9-									0.0		
10 - -											
11-	Additional designation of the control of the contro		-	SAND/GRAVE SILT (ML):	:L (SW):			-			
- 12-					ED SAND (SW):				0.0		
13-)1157								0.0		
13-	073001157										[
14-				***							RMRK3
				Geom	natrix Consultants		Pro	ject l	No. 7168		Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP19 (cont'd) SAMPLES PID READING (ppm) UEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 15 Total Depth: 15 feet below ground surface 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 RMRK3 /XX **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJE	CT:	٨	/lortor	n Reading FI			Lo	g of Bo	oring No.	DP20
BORIN	G LOC	CAT	ION:	Circle (Geo	phys. Anom. H)		ELEVATION AN 553.84 ft. (M			
DRILLI	NG CC	TNC	RACT	OR: H.C. N	Nutting		DATE STARTE 7/30/01	D:	7/30/01	· ·
DRILLI	NG ME	ΞTΗ	IOD:	Direct Push	1		TOTAL DEPTH 15.0	(ft.):		ING POINT: Surface
DRILLI	NG EC	QUIF	PMENT	Geoprob	e 5400		DEPTH TO WATER	FIRST	COMPL.	24 HRS.
SAMPL	ING M	ΙEΤ	HOD:	Macro Too	ol .		LOGGED BY: E. Mansell			
HAMMI	,			NA	DROP: NA		RESPONSIBLE M. Hemingw		ONAL:	REG. NO.
DEPTH (feet)	Sample No.		Blows/ Sar	NAME (L	DESCRIPTION USCS): color, moist, % by wt., plast. cementation, react. w/HCl, geo.			PID	(mdd)	REMARKS
	Ö	ŭ	<u> </u>	GRASS	Surface Elevation: 5	553.84 ft. (MSL)		<u>~</u>		
_				GRAVEL/BA	SE					
1-										
2-	073001158			SANDY CLA	NY (CL): dark yellowish brown (1	0YR 3/5) ~80%	low			
	07				~20% sand, soft	5 TT 6/6/3, 55 76 1		_		
3-										
4-								0.0		
_										-
5-										
6-					RADED SAND (SP): dark yellow medium sand, ~10% fines, grav		4/4),			
_										
7-		V						0.0		
8-		/		30% gravel,	trace fines			-		
_										
9-										
10-										
_		\								
11-										
12-		<u>/ \</u>						0.0		
										. 1000
13 <i>-</i> -										I
14-										RMRK3
				Geo	omatrix Consultants		Proje	ect No. 7168	· · · · · · · · · · · · · · · · · · ·	Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP20 (cont'd) SAMPLES PID READING (ppm) оЕРТН (feet) REMARKS DESCRIPTION Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 073001159 POORLY GRADED SAND (SP): continued Medium sand, black, odor at 14.5' to 15' 15 Total Depth: 15 feet below ground surface 16 17 18-19 20 21 22 23 24 25 26-27 28-29 30 RMRK3 /XC Page 2 of 2 **Geomatrix Consultants** Project No. 7168

PROJECT:	Morton F	Reading FI				Log	of Bori	ing No. D	P21
BORING LOCA	TION:	W. of Bldg. 9			LEVATION 63.04 f				
DRILLING CON	ITRACTOR	: H.C. Nu	tting	D	ATE STA //31/01)	DATE FINISH	IED:
DRILLING METI	HOD:	Direct Push		T	OTAL DE	PTH (ft.)	:	MEASURING Ground Su	
DRILLING EQU	IPMENT:	Geoprobe	5400	D	EPTH TO		IRST 9.8	COMPL.	24 HRS.
SAMPLING ME	THOD:	Macro Tool		Lo	OGGED . Mans	BY:			
HAMMER WEIG	GHT:	NA	DROP: NA	R		SIBLE PR	OFESSION	IAL:	REG. NO.
DEPTH (feet) Sample Sam		NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. c cementation, react. w/HCl, geo. ir	density, structure,	<u> </u>	ingway	PID READING (ppm)	REI	MARKS
	8 = -	CONCRETE	Surface Elevation: 56	3.04 ft. (MSL)			<u> </u>		
4			(CL): (2.5Y 5/4), light olive brow	wn moist ~80%				PID nonfunct	ional
1-			c fines, ~20% sand, trace grave					TID HOMOTO	ionar
-									
2-									
3									
4-									
-									
5-									
-						-			
6-						-			
-									
7-									
8-									
9-		0.11.1	0.41						
4		Silt lens at 9' -	9.4						
10-		Dark grayish b	rown, ~95% high plasticity fines	s, ~5% sand		\ <u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>		Groundwater	9.8' bgs
11-		1/2" gray lamir	nations at 11' to 12', ~100% hig	h plastic fines					
12-									
-		Same as abov	e, wet, some sand and gravel a	at 12'					
13-		CLAYEY SAN	D (SC): wet, ~70% medium coa		edium	\dashv			
		plastic fines							
14		Geom	Andre Company to the state of			Danie ii	1- 7400		RMRK3
		Geom	atrix Consultants			Project N	vo. /168	F	age 1 of 2

PROJECT: Mo	orton Reading Fl	Log of Bo	Log of Boring No. DP21 (cont'd)							
SAMPLE			<u>o</u>	DEMARKS						
Sample No.	DESCRIPTION NAME (USCS): color, moist, % by wt., p cementation, react. w/HCl,	plast. density, structure, geo. inter.	PID READING	REMARKS						
15-	Very dark grayish brown (2.5Y 3/2) at 1	5' to 16'	_	Formation appears to be						
16-	CLAYEY SAND (SC): light olive brown ((2.5Y 5/6), saturated, ~70%	_ -	under pressure, pushed prob back up 2' (probe at 20' to 24						
17-	medium sand, ~30% fines									
18-	~30% fines at 17.5' to 18' coarse sand									
19-			-							
20-	01.07/(01) 11.11.11.11.11.11.11.11.11.11.11.11.11.	4000/11/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/								
21-	CLAY (CL): light olive brown (2.5Y 5/4), trace fine sand, firm	wet, ~100% high plactic fines,								
22-										
23-										
24-										
25-	Total Depth: 24 feet below ground surfa	ce								
26-										
_			-							
27-										
28-										
29-										
30-										
31				RMRKS						
	Geomatrix Consultants	F	Project No. 7168	Page 2 of 2						

PROJECT: N		Log of Boring No. DP22							
BORING LOCATI	ION:	Between Bldg	s. 3A and 10		ELEVATION 563.68 ft. (
DRILLING CONT	RACTOR	H.C. Nut	ting		DATE START 8/1/01	TED:		DATE FINIS 8/1/01	HED:
DRILLING METH	IOD:	Direct Push			TOTAL DEPT 24.0	ΓΗ (ft.):	MEASURIN Ground S	
DRILLING EQUIP	PMENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPLING METI	HOD:	Macro Tool			LOGGED BY E. Mansell				
HAMMER WEIGH	HT:	NA	DROP: NA		RESPONSIB M. Heming			AL:	REG. NO.
Ceet) Sample No. Sample	T	NAME (USC	DESCRIPTION CS): color, moist, % by wt., plast. densit cementation, react. w/HCl, geo. inter.	y, structure,			PID READING (ppm)	RI	EMARKS
S es	8 -		Surface Elevation: 563.68	ft. (MSL)					
-		Concrete				_			
1			k yellowish brown (10YR 4/4), mois	st, ~90% me	edium				
2-		,	3 ,			_	-		
3-							0.0		
4 SANDY CLAY (CL): ~60% low plastic fines, ~40% well graded sand									
5-		and gravel CLAY (CL): yel fines, trace sar	lowish brown, moist, ~100% mediu	m - high pla	astic	$\frac{1}{1}$			1
-		inics, trace sar	a, graver (un)			-			
6-							0.0		
7-						-			
8-									
		Fine gray lamir	ations at 8.5' to 9', weak bedding			-			
9-		SANDY SILT (I	ML): wet, ~70% low plastic fines, ~3	30% fine sa	nd,	- -	0.0		
10-		CLAY (CL): da	k grayish brown (2.5Y 4/2), moist, race fine sand	~100% high	1	- -			
11-		Sandy silt lens	at 10.8' to 11'						
12-									
-		Saturated clav	at 12' to 16', appears to be under p	ressure, ze	ro				
13-		recovery	. ,,	., =					7
14							-		
	1	Geom	atrix Consultants		Pr	oject	No. 7168		Page 1 of 2

PROJEC	CT: Morton	Reading FI	Log of Bor	ing No. [DP22 (cont'd)
UEPTH (feet)	Sample No. Sample Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. o cementation, react. w/HCl, geo. i	density, structure, nter.	PID READING	REMARKS
	0, 0,	CLAY (CL): continued			
-	$ \rangle / $				
15-					
16-		0.000			
		CLAY (CL): gray (2.5Y 5/1), moist, 100% high homogeneous, firm to soft	n plastic fines,		
17-		•			
''					
10					
18-				0.0	
19-					
20-		Same as above			
21-					
22-					
1 -	$\setminus \setminus \setminus \setminus$				
23-					
24-				1	
		Total Depth: 24 feet below ground surface			
25					
25-					
26-					
27-					
28-					
-					
29-					
30-					
1					. ча
31					
					RMRK3
	- /.	Geomatrix Consultants	Proj	ject No. 7168	Page 2 of 2

PROJECT: Morton Reading FI				Log of Boring No. DP23							
BORIN	G LOC	CATI	ION:	Between Bld	gs. 10 and 3		ELEVATION / 563.41 ft. (
DRILLI	NG CC	TNC	RACTO	DR: H.C. N	utting		DATE START 8/1/01		-)	DATE FINIS 8/1/01	SHED:
DRILLI	NG ME	ΞΤΗ	OD:	Direct Push			TOTAL DEPT 24.0	H (ft.):	MEASURIN Ground S	
DRILLII	NG EC	QUIF	PMENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPL	ING M	1ETI	HOD:	Macro Tool			LOGGED BY: E. Mansell				
HAMMI	ER WE	EIGI	HT:	NA	DROP: NA		RESPONSIBL M. Heming			AL:	REG. NO.
DEPTH (feet)	Sample No.		Blows/ S Foot	NAME (US	DESCRIPTION SCS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.	, structure,			PID READING (ppm)	R	EMARKS
1- 2- 3- 4- 5- 6- 7- 8- 9- 10- 11- 12- 13-	080101161			CLAY (CL): lig ~100% mediu	Surface Elevation: 563.41 ft. (CL) [FILL]: olive brown (2.5Y 4/3), m-25% sand gravel, soft to firm, odor ght olive brown (5Y 5/4), olive gray lam plastic fines, trace sand, hard, odor and gravel, dark gray (2.5Y 4), gray sand and gravel, dark gray (2.5Y 4).	noist, ~759			0.0		
- 14-				homogeneous	5						
14			1.	Geor	natrix Consultants		Pro	oject	No. 7168		Page 1 of 2
											-

Morton Reading FI PROJECT: Log of Boring No. DP23 (cont'd) SAMPLES PID READING (ppm) UEPTH (feet) REMARKS DESCRIPTION Sample No. Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CL): continued 15 16 CLAYEY SAND (SC): light olive brown (2.5Y 5/4), saturated, ~70% coarse sand, ~30% fines, strong chemical odor 17 18 0.0 CLAY (CL): gray (2.5Y 5/1), moist to wet, ~100% high plastic fines, 19 soft, homogeneous, odor 20 21 22 1" sand lens, wet at 22.5' 23 24 Total Depth: 24 feet below ground surface 25 26 27 28 29 30 31 RMRK3 /XX **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Mortor	ROJECT: Morton Reading FI					Log of Boring No. DP24						
BORING LOCATION:	N.E.of Bldg.	1		TION AND 2 ft. (MS	D DATUM: SL)							
DRILLING CONTRACTO	OR: H.C. Nu	utting	DATE : 8/6/01	STARTED 1):	DATE FINISH 8/6/01	HED:					
DRILLING METHOD:	Direct Push		TOTAL 24.0	DEPTH (ft.):	MEASURING POINT: Ground Surface						
DRILLING EQUIPMENT	τ: Geoprob e	5400	DEPTH WATE		FIRST	COMPL.	24 HRS.					
SAMPLING METHOD:	Macro Tool			ED BY:	1							
HAMMER WEIGHT:	NA	DROP: NA	RESPO		PROFESSION	AL:	REG. NO.					
(feet) Sample No. Sample Sample Blows/ Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.			PID READING (ppm)	RE	MARKS					
S S H	Concrete	Surface Elevation: 563.12 ft.	(MSL)		ir.							
			-									
1		(CL) [FILL]: dark yellowish brown (10			_							
2-	~70% low pias	stic fines, ~30% sand/gravel, soft to fir	III									
_					_							
3-					0.0							
4												
5-		ADED SAND (SP): light olive brown (2 m sand, trace fines, trace gravel	2.5Y 5/4), moist,									
6-					0.0							
					_							
7-					_							
8-												
9-	2" Cobble at 9		(4)		0.0							
-		′ (CL): [TILL]: light olive brown (2.5Y 5 c fines, ~10% sand, trace gravel	74), moist, ~90%									
10-												
11-												
		ADED SAND (SP): dark yellowish brownedium sand, ~10% fines, trace fine g			-							
12-												
					-							
13-												
14												
	Geon	natrix Consultants		Projec	ct No. 7168	F	RMRK3 Page 1 of 2					

Morton Reading FI PROJECT: Log of Boring No. DP24 (cont'd) SAMPLES PID READING (ppm) UEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 13.8' 1" - 2" gravel POORLY GRADED SAND (SP): CONTINUED 15 0.0 16 17 18-SANDY CLAY (CL): dark yellowish brown (10YR 4/4), moist to wet, ~80% fines, ~20% sand, trace gravel, firm 0.0 19 POORLY GRADED SAND (SP): brown (10YR 4/3), moist, ~70% medium sand, ~20% fine gravel, ~10% fines 20 21 22-23 Clay 23' - 23.5' 24 Total Depth: 24 feet below ground surface 25 26 27 28 29 30 31 RMRK3 1199 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJE	PROJECT: Morton Reading FI				Log of Boring No. DP25						
BORIN	G LO	CAT	ION:	Bldg. 6 Load	ling Dock		ELEVATION 575.17 ft. (
DRILLI	NG C	ONT	RACTO	DR: H.C. N	utting		DATE START 8/7/01			DATE FINI 8/7/01	SHED:
DRILLII	NG M	ЕТН	IOD:	Direct Push			TOTAL DEPT	H (ft	.):	MEASURIN Ground S	
DRILLII	NG E	QUIF	PMENT	: Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPL	ING N	МЕТ	HOD:	Macro Tool			LOGGED BY E. Mansell	:			
HAMMI	ER W	EIG	HT:	NA	DROP: NA		RESPONSIB M. Heming			IAL:	REG. NO.
DEPTH (feet)	Sample No.	<u>e</u>	Blows/ S Foot	NAME (US	DESCRIPTION 6CS): color, moist, % by wt., plast. cementation, react. w/HCl, geo.	density, structure,			PID READING (ppm)	R	EMARKS
ш	Sa	Sa	B L	A I - II	Surface Elevation: 5	575.17 ft. (MSL)		-	82		
-		X		Asphalt				-			
1- -	080701164 (BLIND DUP)				′ (CL): dark greenish gray (10\ -10% sand, black laminations,		ium	 -	1		
2-	164 (BLI							-			
_	080701							-	0.2		
3-	l							-			
4-	080701163	-		Same as abov	ve, trace gravel, wet, odor			-		Water cam	e up to ~14" bgs at
_				Came as abo	ve, trace graver, wet, odor			-			nple interval
5-								-	0.2		
6-								-			
_								-			
7-	1165							-			
8-	080701165							-			
_								-			
9-								-	0.1		
10-				Yellowish bro	wn (10YR 5/6), firm			- -			
-								-			
11-								-			
								-			
12-			1					-	0.3		
13-								-	-		
								-			
14-							γ				RMRK3
				Geor	natrix Consultants		Pr	oject	No. 7168		Page 1 of 2

PROJE	CT:	N	lortor	n Reading FI	Log of Bo	oring	No. C	P25 (cont'd)
_		MPI	LES	DECORPORION			<u> </u>	DEMARKO
UEPTH (feet)	Sample No.	Sample	Blows/ Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. ir			PID READING (ppm)	REMARKS
				SANDY CLAY (CL): CONTINUED	-		0.2	
15-				1" sand gravel layer, gray, wet, odor				
16-				SILT (ML): gray (10YR 5/1), moist, ~100% low sand, firm	plastic fines, trace fine			Hole collapsed at 16' twice move to dual tube at 16', bent
17-						-		rod at 16'
18-				Fine black laminations at 17.5' to 18.5'			0.3	
_				18.5' to 18.8' silty sand, wet				
19-				SILTY CLAY (CL): dark gray (10YR 4/1), mois fines, ~10% fine sand, firm	t, ~90% low plastic	_		
20-				CLAY (CL): gray (2.5Y 5/1), moist, ~100% hig homogeneous	h plastic fines, soft,			
21-				,				
_								
22-								
_								
23-		X						Outer casing to 24', water at 22' bgs, pour grout through outer casing
24-		<u> </u>		Total Depth: 24 feet below ground surface				, and the second
-						-		
25-								
26-								
27-	and a state of the							
_								
28-								
29-								
30-								
- 24								
31-								RMRK3
			/	Geomatrix Consultants	Р	roject N	o. 7168	Page 2 of 2

PROJE	CT: Morton	Reading FI			Log of Boring No. DP26					
BORIN	G LOCATION:	W. of E. Ta	nk Farm	577.89						
DRILLII	NG CONTRACTO	R: H.C. N	lutting	DATE ST. 8/7/01		-1	DATE FINIS 8/7/01	HED:		
DRILLI	NG METHOD:	Direct Push	1	TOTAL D 24.0	EPTH (ft.):	MEASURIN Ground S			
DRILLII	NG EQUIPMENT:	Geoprob	e 5400	DEPTH T WATER	0	FIRST	COMPL.	24 HRS.		
SAMPL	ING METHOD:	Macro Too	ıl	LOGGED E. Mans						
HAMM	ER WEIGHT:	NA	DROP: NA		SIBLE PF	ROFESSION	AL:	REG. NO.		
DEPTH (feet)	Sample No. Sample Blows/ Sample Foot	NAME (U	DESCRIPTION ISCS): color, moist, % by wt., plast. densit cementation, react. w/HCl, geo. inter. Surface Elevation: 577.89		PID Starbing (ppm)			EMARKS		
- 1-		Asphalt, fill					PID nonfund	ctional		
2- -		SANDY CLA fines, ~20%	Y (CL): dark olive gray (5Y 3/2), mois sand	t, ~80% low plastic	_					
3-	-	Brown (10YF								
4-		Same as abo	ove, ~95% fines, ~5% fine sand							
5-		Light olive br	rown (2.5Y 5/4), trace fine gravel		-					
6-					-					
7-	_									
8-			t), wet, ~70% fines, ~30% sand, trace fines, ~10% sand, trace gravel, hard	gravel	_					
9-		Light olive br	rown (2.5Y 5/4)		_					
10-	-	1" to 2" Grav	vel at 10.2' to 10.4'							
11-					-					
12-		SANDY CLA	ellowish brown (10YR 5/6) at 11.5' to							
13- -		- 10% Sand,	trace gravel, hard							
14-								RMRK3		
	//	Geo	matrix Consultants		Project	No. 7168		Page 1 of 2		

PROJE	ECT: Morton	Reading FI	Log of Boring	y No. DP26 (cor	ıt'd)				
DEPTH (feet)	Sample No. Sample Blows/ Sample Foot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. in	ensity, structure, ter.	PID READING (ppm)	MARKS				
_	_	SANDY CLAY (CL): continued							
15-	_	SANDY CLAY (CL): light olive brown (2.5Y 5/4 ~10% sand, trace gravel, hard), wet, ~90% fines,						
16-		Same as above, hard	-						
17-			-						
18-	-		-						
19-		Sand, gravel lens at 19.2' to 19.3'							
20-			-						
21-	_		-						
22-									
23-									
24-		Total Depth: 24 feet below ground surface							
25-	-		_						
26-	-		-						
27-	-								
28-	- .		-						
29-	-		-						
30-	1								
31-					RMR K3				
	Geomatrix Consultants Project No. 7168 Page 2 of 2								

PROJECT: Morto	on Reading FI			Log of Boring No. DP27					
BORING LOCATION:	W. of Bldg. 2			ATION AND DATUM: 35 ft. (MSL)					
DRILLING CONTRAC	TOR: H.C. Nu	utting	DATE ST. 8/8/01	ARTED:		DATE FINISH 8/8/01			
DRILLING METHOD:	Direct Push		TOTAL D 24.0			MEASURING POINT: Ground Surface			
DRILLING EQUIPMEN	NT: Geoprobe	5400	DEPTH T WATER		FIRST	COMPL.	24 HRS.		
SAMPLING METHOD:	Macro Tool	T	LOGGED E. Mans	sell	0550000				
HAMMER WEIGHT:	NA	DROP: NA	M. Hem		ROFESSION	AL: 	REG. NO.		
(feet) Sample No. Sample Blows/ Enort	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. densit cementation, react. w/HCl, geo. inter.	y, structure,		PID READING (ppm)	RE	MARKS		
8 8 2	Asphalt/ grave		ft. (MSL)						
1-	Sand/gravel fi	II material							
2-				-					
-	SANDY CLAY	(CL): very dark gray (2.5Y 3/1), mo	ist, ~80% low						
3	plastic fines, ~	20% sand, trace gravel, hard		, _	0.0				
4-	Dia di atainina	aday at 41 to Cl							
-	Black staining	, odor at 4' to 6'		-			l		
5-									
6									
- \/				-					
7-									
8-					040				
		ve, soft, no gravel, strong odor, black t 8' to 12'), wet	staining		210				
9-				-					
10-									
11-									
-									
12	Harder than a	bove 0YR 3/3), dry to moist at 12.5' to 13'			218				
13]			-4			
_	~80% medium	I CLAY (CL) [TILL]: dark greenish gr n plastic fines, ~20% medium fine sa							
14		minations at 13' to 14', hard					RMRK3		
	Geon	natrix Consultants		Project I	No. 7168	F	Page 1 of 2		

PROJE	CT:	N	/lorton	Reading FI	Log of Boring No. DP27 (cont'd)						
		AMPI	LES	DESCRIPTION			<u>o</u>		DEMARKS		
UEPTH (feet)	Sample No.	Sample	Blows/ Foot	NAME (USCS): color, moist, % by wt., plast. d cementation, react. w/HCl, geo. ir	ensity, structure, iter.		PID READING (ppm)		REMARKS		
				SANDY LEAN CLAY (CL) [TILL]: continued			0.0				
_											
15-											
_											
16-											
_											
17-											
_						-					
18-						-	0.0				
_				CLAYEY GRAVEL (GC): dark greenish gray (5GY 4/1), wet to	-		Becomes	wet at 18.2'		
19-		\vdash		saturated, ~80% fine gravel/coarse sand, ~20	% fines						
_		X				-					
20-											
_											
21-		H		SANDY LEAN CLAY (CL) [TILL]: dark greenis	h gray (5GV 2/1) maist	-	0.4				
_		\mathbb{N}		~80% medium plastic fines, ~20% medium fin		_					
22-				dark brown laminations at 13' to 14', hard							
_		\									
23-											
_		$\ \cdot \ $									
24-		<u> </u>									
_				Total Depth: 24 feet below ground surface							
25-											
_											
26-											
27-											
- ·											
28-		1000									
29-											
<u> </u>											
30-											
30-											
24											
31-									RMRK3		
	Geomatrix Consultants Project No. 7168 Page 2 of 2										

PROJECT: Morton Reading FI					Log of Boring No. DP28					
BORING LOC	ATION:	W. of Bldg. 1	5		VATION AN					
DRILLING CC	NTRACTOR	R: H.C. Nu	utting	DAT 8/8/	E STARTEI /01	D:		DATE FINIS 8/8/01		
DRILLING ME	THOD:	Direct Push		тот 24.0	AL DEPTH	(ft.)	:	MEASURING Ground S		
DRILLING EC	UIPMENT:	Geoprobe	5400	DEP WAT	TH TO FER	F	IRST	COMPL.	24 HRS.	
SAMPLING M	ETHOD:	Macro Tool			GED BY: Mans ell					
HAMMER WE	EIGHT:	NA	DROP: NA		PONSIBLE Hemingwa		OFESSION	AL:	REG. NO.	
e et H	Sample Sample Blows/ Sample Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. densit cementation, react. w/HCl, geo. inter.	ty, structure,			PID READING (ppm)	RE	MARKS	
OEP (fee Samp No.	Sample Blows/ Foot			ft. (MSL)			RE,			
		Asphalt								
1-		SANDY CLAY ~30% sand, so	(CL) [FILL]: dark brown (10YR 3/3), oft	ne,						
2-							0.0			
3-						-				
4-		Dark yellowish	n brown (10YR 4/4)							
5-										
						-				
6-						-	0.0			
7-			CLAY (CL) [TILL]: light olive brown 15% sand, trace gravel with gray lan							
8-	A	hard	10 % sand, trace graver with gray ran	minations, ilim to		-				
9-			(7.5) (7.0)			-	0.0			
-		Dark brown fir	nes (7.5YR 3/3), wet, 1" to 2" gravel							
10-									!	
11-									!	
12-		POORLY GRA	ADED SAND (SP): saturated			-	0.0			
13-	13-								- 194	
-			ark yellowish brown (10YR 3/4)	nlastic fines		\dashv				
14		·	m gray (10111 4/1), wet, 100/0 low	plactic iiiico,					RMRK3	
•	17	Geom	natrix Consultants		Proje	ect N	No. 7168		Page 1 of 2	

Log of Boring No. DP28 (cont'd) SAMPLES PID READING (ppm) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. trace fine sand, soft to firm 15 0.3 16 SILTY SAND (SM): saturated 17 SILT (ML): dark gray (10YR 4/1), wet, ~100% low plastic fines, trace fine sand, soft to firm 18-19 0.4 Black laminations at 19' to 19.7' 20 SILTY CLAY (CL): dark gray (10YR 4/1), moist, ~100% high plastic fines, firm 21 22 23 24 Total Depth: 24 feet below ground surface 25 26 27 28 29 30-RMRK3 /XX **Geomatrix Consultants** Project No. 7168 Page 2 of 2

Morton Reading FI

PROJECT:

PROJECT: Morton Reading FI			Lo	Log of Boring No. DP29				
BORING LOCATIO	DN: E. of Tank V		ELEVATION AND DATUM: Ground 578.13 ft. (MSL) (estimated)					
DRILLING CONTRA	ACTOR: Geoma	11/9/01	ED:	DATE FINISHED: 11/9/01				
DRILLING METHO	D: Hand Auger	TOTAL DEPTH	l (ft.):	MEASURING POINT: Ground Surface				
DRILLING EQUIPM	MENT: 3 1/2" Dia	ameter Hand Auger	DEPTH TO WATER	WATER				
SAMPLING METHOD: Hand Auger LOGGED BY E. Mansell								
HAMMER WEIGHT	T: NA	DROP: NA	RESPONSIBLE M. Hemingv	E PROFESSION va y	IAL: REG. NO. NA			
(feet) Sample No. Sample		DESCRIPTION SCS): color, moist, % by wt., plast. density, structu cementation, react. w/HCl, geo. inter.		PID READING (ppm)	REMARKS			
Sa Sa		Surface Elevation: Ground 578.131	t. (MSL) (estimated	, R				
1- 2- 3- 4- 5- 10- 8- 9- 10- 11- -	medium sand	Y (CL): light brown, moist, ~80% high plastic if firm 5 feet below ground surface	fines, ~20%		Note: PID 3.9 ppm at top of borehole when total depth was reached.			
12-								
13-								
14					RMRK3			
	Geor	matrix Consultants	Proj	ect No. 7168	Page 1 of 1			

PROJECT: Morton Reading FI			L	Log of Boring No. DP30 ELEVATION AND DATUM: 562.08 ft. (MSL)				
BORING LOCATION:								
DRILLING CONTRACTO	DATE START 12/5/01		DATE FINISHED: 12/5/01					
Direct Push				TOTAL DEPTH (ft.): 20.0		MEASURING POINT: Ground Surface		
DRILLING EQUIPMENT: Geoprobe 5400			DEPTH TO WATER	FIRST	COMPL.	24 HRS.		
SAMPLING METHOD:	Macro Tool		LOGGED BY:		1			
HAMMER WEIGHT: NA DROP: NA			RESPONSIBLE PROFESSIONAL: M. Hemingway			REG. NO NA		
DEPTH (feet) Sample No. Sample Sample Blows/ Sample Foot	NAME (US	DESCRIPTION CCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		PID READING (ppm)	RE	MARKS		
Sa Sa H	Asphalt/Conc	Surface Elevation: 562.08 ft. (MSL)		嚴				
1-		ADED SAND with GRAVEL (SC) [FILL]						
2-				-				
3-		ens dark olive gray [FILL]						
4-		ADED SAND (SC) [FILL]: light olive brown (2.5Y nedium sand, ~5% gravel (<1/2"), trace fines	′ 5/6),					
- []				_				
5- - 6-		I CLAY (CL) [FILL]: dark olive gray (5Y 3/2), monoplastic clay, ~15% sand, trace gravel (1"), soft		0.0				
7-				_				
8-	1" - 2" pieces	of asphalt		_				
9-				_ _ 0.0				
10-	CLAY (CL): D	ale yellow (2.5Y 8/2), moist, ~100% low plastic f	ines, soft					
11-	SANDY LEAN	I CLAY (CL): very dark grayish brown (2.5Y 3/2) stic fines, ~15% gravel and sand						
12-				0.0				
13-	POORLY GR ~100% mediu	ADED SAND (SP): yellowish brown (10YR 5/4), m sand	moist,					
14						RM		
	Geor	natrix Consultants	Pro	oject No. 7168		Page 1 of 2		

Morton Reading FI PROJECT: Log of Boring No. DP30 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 15 16 Wet 17 0.0 18 19 19' - 19.5' Silt lens - saturated 20 Total Depth: 20 feet below ground surface 21 22 23 24 25 26 27 28 29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJE	ROJECT: Morton Reading FI				Log of Boring No. DP31						
BORIN	IG LO	CATI	ON:	N. Parking Lo	ot		ELEVATION 561.68 ft.				
DRILLI	NG C	ITNC	RACTO	R: H.C. Nu	tting		DATE STAI 12/5/01		-/	DATE FINISI 12/5/01	HED:
RILLI ا	NG M	ETH	OD:	Direct Push			TOTAL DEI	PTH (ft.):	MEASURING Ground St	
DRILLI	NG E	QUIP	MENT:	Geoprob e	5400		DEPTH TO FIRST COMPL. 24 HRS. WATER				
SAMPL	ING N	ΛΕΤΗ	HOD:	Macro Tool			LOGGED B				
НАММ	ER W	EIGH	HT:	NA	DROP: NA			BLE PF	ROFESSION	AL:	REG. NO.
DEPTH (feet)	Sample No.	Sample N	Blows/ S Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., cementation, react. w/HCl	plast. density, structure,	PID READING (ppm)			RE	MARKS
<u> </u>	Sa	Sa	<u> </u>	Asphalt	Surface Elevation:	561.68 ft. (MSL)			2.		
-	_		-		CLAY (CL) [FILL]: light of	olive brown (2.5Y 5/3),	moist,	_ -			
1-	-			~90% medium	plastic fines, ~10% sand	l, trace gravel, soft/firn	n				
2-											
3-									0.0		
-								-			
4-	-							-			
_								_			
5-											
6-									0.0		
_								-			
7-	-							-			
-								-			
8-											
9-									0.0		
9-									0.0		
10-	-							-			
-	-			Small black (bi	urned?) material (1/2" ha	rd)		-			
11-	-					-,		-			
-	-							-			
12-									0.0		
13-											n
-								-			
14-											RMR K 3
				Geom	atrix Consultants		1	Project	No. 7168	F	Page 1 of 2

PROJECT: Morton Reading FI Log of Boring No. DP31 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY LEAN CLAY (CL) [FILL]: 120501294 4.9 15 Black staining, odor POORLY GRADED SAND (SP): olive gray (5Y 5/2), moist, ~100% medium sand, saturated at 17' 16 17 18 Total Depth: 18 feet below ground surface 19 20 21 22 23 24 25 26 27 28 29 30 RMRK3 Project No. 7168 Page 2 of 2 **Geomatrix Consultants**

PROJECT: Morton Reading FI	Log	g of Bori	ing No. D	P32
BORING LOCATION: Parking Lot	ELEVATION AND 562.64 ft. (MS			
DRILLING CONTRACTOR: H.C. Nutting	DATE STARTED 12/5/01		DATE FINISH 12/5/01	ED:
RILLING METHOD: Direct Push	TOTAL DEPTH ((ft.):	MEASURING Ground Su	
DRILLING EQUIPMENT: Geoprobe 5400	DEPTH TO WATER	FIRST	COMPL.	24 HRS.
SAMPLING METHOD: Macro Tool	LOGGED BY: E. Mansell			
HAMMER WEIGHT: NA DROP: NA	RESPONSIBLE M. Hemingwa		AL:	REG. NO.
SAMPLES SAMPLES DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		PID READING (ppm)	REM	MARKS
Surface Elevation: 562.64 ft. (MSL) Asphalt		<u> </u>		
SANDY CLAY (CL): dark yellowish brown (10YR 4/6), moist, low plastic fines, ~10% fine sand, firm	~90%	-		
Fine gravel at 2.5'		0.0		
Dark brown wood material at 3.5' Very pale brown (10YR 8/2) diatemaceous silty clay Same as above [FILL]		-		
5- - 6- Dark grayish brown (2.5Y 4/2)		0.0		
7- 8-		_		
SILTY CLAY (CL): [FILL] white (5Y 8/1), moist, ~95% low plast ~5% very fine sand, blocky, soft (cemented) 1" throughout	stic fines,	- 0.0		
10-				
12 Same as above		0.0		
SANDY CLAY (CL): [FILL] dark yellowish brown (10YR 4/4), r ~90% low plastic fines, ~10% sand, firm	moist,			
Geomatrix Consultants	Proied	ct No. 7168	Р	age 1 of 2

PROJECT: Morton Reading FI Log of Boring No. DP32 (cont'd) PID | READING | | (ppm) SAMPLES DEPTH (feet) DESCRIPTION REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. 15 0.0 POORLY GRADED SAND (SP): light olive brown (2.5Y 5/3), moist, ~100% medium sand 16 Total Depth: 16 feet below ground surface 17 18 19 20 21 22 23 24 25 26 27 28 29 30 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morto	DJECT: Morton Reading FI				Log of Boring No. DP33					
BORING LOCATION:	Parking Lot		ELEVATION 562.95 ft.							
DRILLING CONTRAC			DATE STAR 12/5/01		1	DATE FINIS 12/5/01	HED:			
RILLING METHOD:	Direct Push	1	TOTAL DEP	TH (ft.)	:	MEASURING Ground St				
DRILLING EQUIPMEN	NT: Geoprob	e 5400	DEPTH TO WATER	F	IRST	COMPL.	24 HRS.			
SAMPLING METHOD:	Macro Too	I	LOGGED B' E. Mansel							
HAMMER WEIGHT:	NA	DROP: NA	RESPONSIE M. Hemin	BLE PR	OFESSION	AL:	REG. N			
Sample No. Sample Blows/	NAME (U	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structu cementation, react. w/HCl, geo. inter.			PID READING (ppm)	RE	MARKS			
, w w a	Asphalt	Surface Elevation: 562.9	95 ft. (MSL)		<u>α</u>					
1-		Y (CL): [FILL]: dark yellowish brown astic fines, ~20% fine sand, firm	n (10YR 4/4), moist,							
-				-						
2-										
3-					0.0					
-		RADED SAND (SP): yellowish brown	n (10YR 5/4), moist,							
4-	- 100 % medi	um plastic sand, trace fines								
5	5' - 5.5' silt le	ens		-						
6-	5.5' - 6.0' cla	y lens			0.0					
-										
7-										
8-										
-										
9-					0.0					
10-										
-										
11-										
12-	Same as abo	ove								
12										
13-										
14							R			
	∕ ∕∕∕ S Geo	matrix Consultants	P	roject N	lo. 7168	F	Page 1 of 2			

PROJECT: Morton Reading FI Log of Boring No. DP33 (cont'd) SAMPLES PID READING (ppm) **DESCRIPTION** REMARKS Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 15 16-Total Depth: 16 feet below ground surface 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Page 2 of 2 **Geomatrix Consultants** Project No. 7168

PROJECT: Morton Reading FI			Log of Boring No. DP34					
BORING LOCATION:	Parking Lot		ELEVATION AND 563.27 ft. (MS					
DRILLING CONTRACT	OR: H.C. Nutting	-	DATE STARTED: 12/5/01	-)	DATE FINISHED: 12/5/01			
JRILLING METHOD:	Direct Push		TOTAL DEPTH (ft 16.0	.):	MEASURING PO			
DRILLING EQUIPMENT	: Geoprobe 5400			FIRST		24 HRS.		
SAMPLING METHOD:	Macro Tool		LOGGED BY: E. Mansell					
HAMMER WEIGHT:	NA DROP: N	NA	RESPONSIBLE P M. Hemingway		AL:	REG. NO.		
(feet) Sample No. Sample Blows/ Foot	NAME (USCS): color, mois	SCRIPTION st, % by wt., plast. density, structure, react. w/HCl, geo. inter.		PID READING (ppm)		RKS		
N N M	Surface E Asphalt	Elevation: 563.27 ft. (MSL)		IK.				
1-	SANDY CLAY (CL): [FILL]: d	dark grayish brown (2.5Y 4/2)	-					
2- - 3-	SILTY CLAY (CL): [FILL]: wh fines, ~5% fine sand, blocky,	nite (2.5Y 8/1), moist, ~95% low p , firm, diatomaceous earth	olastic -	0.0				
4-	Same as above		-					
5- - 6-			-	0.0				
7- -			-					
8-	Same as above		_					
9-			-	0.0				
10-			-					
11-			-					
12-	Same as above		-	- 0.0				
13-			-	-				
_			-	_				
14	~~~					RMRK3		
	Geomatrix Consul	Itants	Project	No. 7168	Pag	e 1 of 2		

PROJECT: Morton Reading FI Log of Boring No. DP34 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY CLAY (CL): dark yellowish brown (10YR 4/4), moist, ~80% low plastic fines, ~20% fine sand, trace gravel, soft 15 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), moist, ~95% medium sand, ~5% gravel, trace fines 16 Total Depth: 16 feet below ground surface 17 18 19 20 21 22 23 24 25 26 27 28 29 30 RMRK3 Project No. 7168 Page 2 of 2 **Geomatrix Consultants**

PROJECT: Morton Reading FI				Log of Boring No. DP35					
BORING LOCATION:	Parking Lot		i i	ELEVATION AND DATUM: 562.87 ft. (MSL)					
DRILLING CONTRACTO	R: H.C. Nu	atting	DATE S' 12/5/0	DATE STARTED: 12/5/01			HED:		
PRILLING METHOD:	Direct Push		16.0	TOTAL DEPTH (ft.): 16.0			MEASURING POINT: Ground Surface		
DRILLING EQUIPMENT:	Geoprobe	5400	DEPTH WATER		ST	COMPL.	24 HRS.		
SAMPLING METHOD:	Macro Tool		LOGGE E. Mar	D BY:					
HAMMER WEIGHT:	NA	DROP: NA	RESPO	PONSIBLE PROFESSIONAL: REG. NO Hemingway NA					
(feet) Sample No. Sample Blows/ Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., plast. den cementation, react. w/HCl, geo. inte Surface Elevation: 562.8	nsity, structure,		PID READING (ppm)	RE	MARKS		
	Asphalt Concrete			_					
2-	SANDY CLAY ~20% medium	(CL): [FILL] brown (5/3), moist, ~8 sand, soft	80% low plastic fines,						
3-	POORLY GRA	ADED SAND (SP): light olive brow	n (2 5Y 5/4) moist		0.0				
4- - 5-		sand, ~5% fines gravel, trace fine							
6-					0.0				
7-									
8-	Same as abov	re							
9-									
11-									
12-	Same as abov	ve							
13-									
14	~~						RMRK3		
	Geom	natrix Consultants		Project No.	7168	F	Page 1 of 2		

PROJECT: Morton Reading FI Log of Boring No. DP35 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION **REMARKS** Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. POORLY GRADED SAND (SP): continued 15 15.5 - 15.8' Silt lens - wet 16 Total Depth: 16 feet below ground surface 17 18-19 20 21 22 23 24 25-26 27 28 29-30 RMRK3 Page 2 of 2 Project No. 7168 **Geomatrix Consultants**

PROJECT: Morton Reading FI					Log of Boring No. DP36							
BORIN	G LOC	CATI	ON:	Parking Lot		<u> </u>	ELEVATION / 561.73 ft. (
DRILLII	NG CC	ITNC	RACTO	PR: H.C. Nu	utting	***	DATE START 12/5/01			DATE FINISH 12/5/01	HED:	
RILLII	NG ME	ETH	OD:	Direct Push			TOTAL DEPT 21.0	H (ft.)	ı:	MEASURING Ground Su		
DRILLII	NG EC	QUIP	MENT:	Geoprobe	5400		DEPTH TO WATER	F	IRST	COMPL.	24 HRS.	
SAMPL	.ING M	1ETH	HOD:	Macro Tool			LOGGED BY: E. Mansell		***			
НАММІ	ER WE	EIGH		NA	DROP: NA		RESPONSIBL M. Heming		OFESSION	AL:	REG. NO.	
DEPTH (feet)	Sample No.	Sample	Blows/ SA Foot	NAME (US	DESCRIPTION CS): color, moist, % by wt., pla cementation, react. w/HCl, ge	eo. inter.	PID READING (ppm)			RE	MARKS	
				Asphalt	Surface Elevation:	561.73 ft. (MSL)						
1- -	-				(CL): [FILL]: very dark gray stic fines, ~20% medium san					PID nonfunct	ional	
2-												
3-		0.000										
4-								-				
-				Same as abov	re			_				
5- -								-				
6-				Black material	<1" (burned?)							
7-												
8-				Sama aa ahau				-				
_				Same as abov	e							
9-												
10-				Reddish browi	n laminations (iron)							
11-												
- 12-				Same as abov	1 0			-				
- 13				Same as abov	·c							
13 ⁻ 												
14-											RMRK3	
			Geomatrix Consultants Project No. 7168 Page 1 of 2									

Morton Reading FI PROJECT: Log of Boring No. DP36 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. SANDY CLAY (CL) [FILL]: continued Odor 15 POORLY GRADED SAND (SP): light olive brown (2.5Y 5/3), moist, ~95% medium sand, ~5% fine gravel 16 17 Black discoloration, strong odor 17.5-19.5' 18 19 SANDY LEAN CLAY (CL): [TILL]: olive (5Y 4/3), moist, ~85% low 20 plastic fines, ~15% fine sand, trace gravel, hard 21 Total Depth: 21 feet below ground surface 22 23 24 25 26 27 28 29 30 31 Page 2 of 2 **Geomatrix Consultants** Project No. 7168

PROJE	CT:	Morton	Reading FI			Lo	og	of Bori	ing No.	DP37
BORING	G LOCA	ATION:	Western Edge	e of Parking Lot		ELEVATION A				
DRILLIN	NG COI	NTRACTO	PR: H.C. Nu	tting		DATE STARTE 12/5/01	D:		DATE FINISHED: 12/5/01	
RILLIN	NG ME	THOD:	Direct Push			TOTAL DEPTH	l (ft.)	:	MEASURIN Ground S	3
DRILLI	NG EQI	JIPMENT:	Geoprobe	5400		DEPTH TO WATER	24 HRS.			
SAMPL	ING ME	ETHOD:	Macro Tool			LOGGED BY: E. Mansell				
НАММЕ	ER WEI	GHT:	NA	DROP: NA		RESPONSIBLE M. Hemingw		OFESSION	IAL:	REG. NO.
DEPTH (feet)		Sample Sample Blows/ Sample Foot		DESCRIPTION CS): color, moist, % by wt., plast. of cementation, react. w/HCl, geo. if Surface Elevation: 56 and Gravel Base (6 - 12")	density, structure, nter. 22.28 ft. (MSL)			PID READING (ppm)	R	EMARKS
1- 2-			А з рпац (6 - 6)) and Graver base (6 - 12)					PID nonfun	ctional
3-							1000			
4-				(CL) [FILL]: yellowish brown (1 s, ~15% fine sand, firm	0YR 5/4), moist	., ~85%				
5-										
6-										
7-										
8-			Dark brown at	8.8' - 9'						
9-			Reddish brown	n (2.5YR 4/4) at 9' - 9.5'						
10-										
11-		$\langle $								
12-			Dark brown (10	OYR 3/3)						
13-										
14-										
			Geom	atrix Consultants		Proj	ect N	No. 7168		Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP37 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. REMARKS Sample No. Sample Blows/ Foot SANDY CLAY (CL) [FILL]: continues 15 16 17 POORLY GRADED SAND (SP): wet 18 19 120501296 20 Total Depth: 20 feet below ground surface 21 22 23 24 25 26 27 28 29 30 31 RMRK3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morton Reading FI				Log of Boring No. DP38							
BORIN	G LOC	CATIO	N:	Parking Lot			ELEVATION AI 562.95 ft. (M		UM:		
DRILLI	NG CO	ONTRA	CTOR	R: H.C. Nu	tting		DATE STARTE 12/5/01			DATE FINIS 12/5/01	HED:
RILLI	NG ME	ETHO	D:	Direct Push			TOTAL DEPTH	l (ft.):		MEASURING Ground S	
DRILLI	NG EC	QUIPM	ENT:	Geoprobe	5400		DEPTH TO WATER	FIRS	ST	COMPL.	24 HRS.
SAMPL	ING N	иЕТНО	D:	Macro Tool			LOGGED BY: E. Mansell				
НАММ	ER WI	EIGHT	:	NA	DROP: NA		RESPONSIBLE M. Hemingw		ESSION	AL:	REG. NO.
DEPTH (feet)	Sample No.	Sample THE	Foot	NAME (USC	DESCRIPTION CS): color, moist, % by wt., cementation, react. w/HCl,	plast. density, structure,			READING (ppm)	RE	MARKS
	San	San	3 5 -		Surface Elevation:	562.95 ft. (MSL)			RE		
_				Asphalt				-			
1-					LL]: yellowish brown (10Y 10% fine sand, hard	'R 5/6), moist, ~90% I	mediu m			PID nonfund	tional
2-											
3-											
-				Dark yellowish	brown (10YR 3/4)						
4-											
5-	-							_			
6-				1/2" cobble at	5.5'						
- 7-											
_								_			
8-										Cobble wed	ged in shoe - zero m 8 to 12'
9-		$ \rangle / $						_			
10-											
-											
11-											
12-											
_											
13-											
14-				POORLY GRA	DED SAND (SP): dark g	rayish brown (2.5Y 4/	2),				
			17	Geom	atrix Consultants		Proj	ect No. 7	7168		Page 1 of 2

Morton Reading FI PROJECT: Log of Boring No. DP38 (cont'd) SAMPLES PID READING (ppm) DEPTH (feet) DESCRIPTION REMARKS Sample No. Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. moist, wet, ~100% medium sand 120501299 Wood material, broken glass, black discoloration, odor at 13.5 - 14' 15-16 Same as above 17 18 19 Odor, black discoloration at 19 - 20' 20 Total Depth: 20 feet below ground surface 21 22 23 24 25 26 27 28

29

30

31

PROJECT: Morton	:	Log of Boring No. DP39						
BORING LOCATION:	S.W. of Bldg	. 30, W. of Fuel Tank		ELEVATION AND 553.09 ft. (M		ATUM:		
DRILLING CONTRACTO	DR: H.C. No	utting		DATE STARTE 3/5/02			DATE FINISI	HED:
RILLING METHOD:	Direct Push			TOTAL DEPTH	(ft.):		MEASURING Ground St	
DRILLING EQUIPMENT	: Geoprobe	5400		DEPTH TO WATER	FII	RST	COMPL.	24 HRS.
SAMPLING METHOD:	Macro Tube)		LOGGED BY: E. Mansell				
HAMMER WEIGHT:	NA	DROP: NA		RESPONSIBLE PROFESSIONA M. Hemingway			AL:	REG. NO.
DEPTH (feet) Sample No. Sample Blows/ ST Foot	SANDY CLAY	DESCRIPTION iCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. inte Surface Elevation: 553. if (CL) [FILL]: dark brown, moist, ~ nedium sand, soft	er. .09 ft. (MSL)	plastic	_	PID READING (ppm)	RE	MARKS
2- - 3-					-			
5- 6- -	Same as abov	/e, few roots, 1/2" gravel [FILL]						
8- 9- 9-	Same as abov	ve			_			
10 - 0000000000000000000000000000000000	include with s	·	jroundwater, d	id not	_			
12-	Total Depth: 1	1 feet below ground surface			_			
14				:				
	George	natrix Consultants		Proje	ect No	o. 7168		Page 1 of 1

PROJECT: Morton Reading FI				Log of Boring No. DP40					
BORING LOCATION:	S.W. of Bld	g 30, W. of Fuel Tank	1	ELEVATION AND DATUM: 553.10 ft. (MSL)					
DRILLING CONTRAC	CTOR: H.C. N	lutting	DATE STAR 3/5/02		DATE FINISHED: 3/5/02				
DRILLING METHOD:	Direct Push	1	6.0						
DRILLING EQUIPME	NT: Geoprob	e 5400	DEPTH TO WATER	FIRST	COMPL. 24 HRS.				
SAMPLING METHOD	D: Macro Tub	oe	LOGGED BY	I					
HAMMER WEIGHT:	NA	DROP: NA	RESPONSIE M. Hemin	BLE PROFESSIO gwa y	NAL: REG. NO.				
Ceet) Sample No. Sample Sample Blows/	NIANAT (I	DESCRIPTION JSCS): color, moist, % by wt., plast. den cementation, react. w/HCl, geo. inte	sity, structure, r.	PID READING	REMARKS				
S S H		Surface Elevation: 553.1 Y (CL) [FILL]: dark brown, moist, ~8	10 ft. (MSL)						
-		medium sand, soft	yo wouldn't placed						
1-									
2-									
3-									
-									
4-									
_									
030502302									
030502301	Total Depth:	6 feet below ground surface							
7- 8									
-									
8-									
9-									
				_					
10-									
11-									
12-									
13-									
14					RMRK3				
	∕ ∕∕ ∕ ⊆ Geo	matrix Consultants	P	Project No. 7168	Page 1 of 1				

PROJECT: Morton Reading FI					Log of Boring No. DP41					
BORIN	G LO	CAT	ION:	S.W. of Blo	dg. 30, W. of Fuel Tank	l l	EVATION AND		****	
DRILLI	NG C	ONT	RACTO	DR: H.C.	Nutting	DA 3/	ATE STARTED: 5/02		DATE FINISH	HED:
RILLI	NG M	ЕТН	IOD:	Direct Pus	h	тс 6.	OTAL DEPTH (f 0	t.):	MEASURING Ground Su	
DRILLI	NG E	QUII	PMENT	: Geoprol	be 5400		PTH TO ATER	FIRST	COMPL.	24 HRS.
SAMPI	ING I	ИЕТ	HOD:	Macro Tu	be		GGED BY: Mans ell			'
HAMN	ER W	EIG	HT:	NA	DROP: NA	RE	SPONSIBLE F . Hemingway		AL:	REG. NO.
HLd3((jee)) 1	030502303 Sample No.	<u>o</u>	Blows/ S Foot	SANDY CL. fines, ~20%	DESCRIPTION USCS): color, moist, % by wt., plast. der cementation, react. w/HCl, geo. inte Surface Elevation: 553.3 AY (CL) [FILL]: dark brown, moist, ~6 medium sand, soft : 6 feet below ground surface	nsity, structure, er. 33 ft. (MSL)		PID READING (PPM)	REI	MARKS
14-				<u>.</u>						RMRK3
			/	⊘ Ge	omatrix Consultants		Projec	No. 7168	F	Page 1 of 1

PROJECT: Morton Reading FI					Log of Boring No. DP42					
BORING LO	OCATI	ON:	S.W. of Bldg.	30, W. of Fuel Tank		ELEVATION 553.15 ft.				
DRILLING (CONT	RACTO	PR: H.C. Nut	iting		DATE STAF 3/5/02	RTED:		3/5/02	
DRILLING I	METH	OD:	Direct Push			TOTAL DEF			MEASURIN Ground S	urface
DRILLING I	EQUIP	MENT:	Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPLING	METH	HOD:	Macro Tube			LOGGED B				
HAMMER \	WEIGH	IT:	NA	DROP: NA		RESPONSIBLE PROFESSIONAL M. Hemingway			AL:	REG. NO.
	No. Sample	Blows/ Foot	SANDY CLAY	DESCRIPTION CS): color, moist, % by wt., plast. cementation, react. w/HCl, geo. Surface Elevation: 5 (CL) [FILL]: dark brown, moistedium sand, soft	inter. 53.15 ft. (MSL)			PID READING (ppm)	R	EMARKS
1- - 2- -							-			
3-										
4-										
5										
030502304			Total Depth: 6	feet below ground surface						
7-										
8-										
9-							-			
10										
11										
12-										
13										
14										RMRK3
		1.	Geom	atrix Consultants		F	Project I	No. 7168		Page 1 of 1

PROJECT: Morton Rea	ading FI	Log of Bori	ng No. DP43
BORING LOCATION:	S.E. of Bldg. 40	ELEVATION AND DATUM: 563.21 ft. (MSL)	
DRILLING CONTRACTOR:	H.C. Nutting	DATE STARTED: 3/5/02	DATE FINISHED: 3/5/02
RILLING METHOD:	Direct Push	TOTAL DEPTH (ft.): 1.5	MEASURING POINT: Ground Surface
DRILLING EQUIPMENT:	Geoprobe 5400	DEPTH TO FIRST WATER	COMPL. 24 HRS.
SAMPLING METHOD:	Macro Tube	LOGGED BY: E. Mansell	
HAMMER WEIGHT: N	DROP: NA	RESPONSIBLE PROFESSION M. Hemingway	AL: REG. NO. NA
SAMPLES (tee)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure cementation, react. w/HCl, geo. inter. Surface Elevation: 563.21 ft. (MSL) [FILL] - SANDY CLAY (CL) Total Depth: 1.5 feet below ground surface	PID READING (Ppm)	REMARKS
12-			
13-			. 40
14			RMRK3
//	Geomatrix Consultants	Project No. 7168	Page 1 of 1

PROJECT: Morton Reading FI	Log of Bor	ing No. DP44
BORING LOCATION: S.E. of Bldg. 40	ELEVATION AND DATUM: 563.61 ft. (MSL)	
DRILLING CONTRACTOR: H.C. Nutting	DATE STARTED: 3/5/02	DATE FINISHED: 3/5/02
DRILLING METHOD: Direct Push	TOTAL DEPTH (ft.): 1.5	MEASURING POINT: Ground Surface
DRILLING EQUIPMENT: Geoprobe 5400	DEPTH TO FIRST WATER	COMPL. 24 HRS.
SAMPLING METHOD: Macro Tube	LOGGED BY: E. Mansell	
HAMMER WEIGHT: NA DROP: NA	RESPONSIBLE PROFESSION M. Hemingway	NAL: REG. NO.
SAMPLES SAMPLES DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	9	
Surface Elevation: 563.61 ft. (MSL)	Ψ	
	-	
1 - 8		
Total Depth: 1.5 feet below ground surface		
	-	
3-	-	
5-		
	-	
6-	-	
7-		
8- 8-	-	
	-	
9-	-	
10-		
11-		
13-		-
14		RMRK3
Geomatrix Consultants	Project No. 7168	Page 1 of 1

PROJE	CT:	M	lorton	Reading FI			Lo	g of Bori	ing No. D	P45
BORIN	G LOC	CATIO	ON:	S.E. of Bldg.	40		ELEVATION AN 563.33 ft. (M			
DRILLI	NG C	TNC	RACTO	PR: H.C. N	utting		DATE STARTED 3/5/02		DATE FINISH	HED:
اRILLI	NG MI	ETHO	OD:	Direct Push			TOTAL DEPTH		MEASURING Ground Su	
DRILLI	NG EC	QUIP	MENT:	Geoprobe	5400		DEPTH TO WATER	FIRST	COMPL.	24 HRS.
SAMPL	ING N	ΛΕΤ Ι	HOD:	Macro Tube	9		LOGGED BY: E. Mansell			
НАММ		EIGH		NA	DROP: NA		RESPONSIBLE M. Hemingwa		IAL:	REG. NO.
HLdBO - 1	0305023	Sample	Blows/ Foot	SANDY CLAY	DESCRIPTION SCS): color, moist, % by wt., pla cementation, react. w/HCl, gr Surface Elevation: ((CL) [FILL]: 1.5 feet below ground surface	eo. inter. 563.33 ft. (MSL)		PID	RE	MARKS
10- -								_		
11-	-									
12-										
13-	-									-
14-										RMRK3
			1	Geor	natrix Consultants	<u></u>	Proje	ct No. 7168	F	Page 1 of 1

PROJE	CT:	M	lorton	Reading FI			Lo	og	of Bori	ng No.	DP46
BORING	G LOC	CATI	ON:	S.E. of Bldg.	40		ELEVATION A 562.87 ft. (N				
DRILLI	NG CC	TNC	RACTO	DR: H.C. Nu	tting		DATE STARTE 3/5/02	ED:		DATE FINIS 3/5/02	
DRILLI	NG ME	ETHO	OD:	Direct Push			TOTAL DEPTH			MEASURIN Ground S	
DRILLI	NG EC	QUIP	MENT	: Geoprobe	5400		DEPTH TO WATER		FIRST	COMPL.	24 HRS.
SAMPL	ING N	/ETH	HOD:	Macro Tube			LOGGED BY: E. Mansell				
НАММ	ER WI	EIGH	IT:	NA	DROP: NA		RESPONSIBLE M. Hemingv			AL:	REG. NO.
DEPTH (feet)	Sample No.	Sample 7	Blows/ S Foot	NAME (USC	DESCRIPTION CS): color, moist, % by wt., pl cementation, react. w/HCl, g	last. density, structure, geo. inter.			PID READING (ppm)	R	EMARKS
	Sar	Sar	B L		Surface Elevation:	562.87 ft. (MSL)			RE		
_				[FILL]				-			
1-	2308		COLUMN					-			
_	030502308			Total Depth: 1.	5 feet below ground surfac	 ce		-			
2-								-			
3-											
_								-			
4-								-			
								-			
5-								-			
6-											
_								-			
7-								-			
								-			
8-								-			
9-											
_								-			
10-								-			
_								-			
11-								-			
-								-			
12-											
13-								-			
_								-			
14-											RMRK3
			1	Geom	atrix Consultants		Pro	ject	No. 7168		Page 1 of 1

BORING LOCATION: —80 ft. W. of Bidg. 40 SGRING SUPPLY (STATE) (MSL) ORILLING CONTRACTOR: Bowser Morner Rotasonic Rota	PROJE	CT:		Morte	on Rea	ading FI		Lo	g of \	Nell l	No. UA\	W01-30
DRILLING CONTRACTOR: Bowser Morner DATE STARTEC: A7/2/01 A7	BORIN	G LC	CA	TION:	~8	60 ft. W. of Bldg. 40	1					
RILLING METHOD: Rolasonic TOTAL DEPTH (ft.): SCREEN INTERVAL (ft.): 14 - 29 DRILLING EQUIPMENT: 8" Diameter outer/4" Diameter inner casing DEPTH-TO-WATER ATD: A 29 DRILLING EQUIPMENT: NA DROP: NA RESPONSIBLE PROFESSIONAL: REG. NO. NA RESPONSIBLE PROFESSIONAL	DRILLI	NG (100	NTRAC	TOR:	Bowser Morner	DATE STA		100 30	DATE FIN		
DRILLING EQUIPMENT: 8" Diameter outer/4" Diameter inner casing DEPTH TO WATER ATD. A" Diameter PVC SAMPLING METHOD: 10" Sample Barrel LEGGED BY: E. Mansell RESPONSIBLE PROFESSIONAL: REG. NO. MA. RESPONSIBLE PROFESSIONAL: REG. NO. M. Herningway MELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS Grass, [FILL]: SANDY CLAY (CL): dark yellowish brown (10YR 4/4) 10									PTH (ft.)	:		NTERVAL (ft.):
SAMPLING EQUIPMENT: 8" Diameter outer/4" Diameter casing NA 4" Diameter PVC SAMPLING METHOD: 10' Sample Barrel E. Mansell HAMMER WEIGHT: NA DESCRIPTION M. Hemingway NAME (USCS): color, most, % by wt., plast density, structure, color of the color of	HILLI	NG I	VIE.	HOD:					WATER	ΑΤΟ:		
HAMMER WEIGHT: NA DROP: NA DESCRIPTION NAME (USCS): color, moist, % by Mr., plast, density, structure, camentalistion, read, wHCl, geo. inter- Surface Elevation: 561.94 (Gmd.) TOC 564.27 ft. (MSL) Grass, [FILL]: SANDY CLAY (CL): dark yellowish brown (10YR 4/4) FOORLY GRADED SAND (SP): yellowish brown (10YR 4/4) BROWN Grass (FILL):	DRILLI	NG E	EQI	JIPMEN	NT:	8" Diameter outer/4" Diameter inner casir	ng 	NA		· · · · · · · · · · · · · · · · · · ·		eter PVC
HAMMER WEIGHT: NA DROP: NA RESPONSIBLE PROFESSIONAL: REG. NO. M. Hemingway SAMPLES SAMPLES SAMPLES SAMPLES SAMPLES SAMPLES SAMPLES SUrface Elevation; read, which geo. inter. Surface Elevation; 561.94 (Gmd.) TOC 564.27 ft. (MSL) Grass, [FILL]: SANDY CLAY (CL): dark yellowish brown (10YR 4/4) 0.0 POORLY GRADED SAND (SP); yellowish brown (10YR 4/4) 10 - 10% gravel Same as above Same as above 10 - 0.0 BESPONSIBLE PROFESSIONAL: REG. NO. M. Hemingway WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS Career Surface Elevation; 561.94 (Gmd.) TOC 564.27 ft. (MSL) FOR Surface Elevation; 561.94 (Gmd.) TOC 564.27 ft. (MSL) A* Diameter Sch. 40 flush-threaded PVC riser with O-rings Cement/bentonite grout 10 - 0.1 Same as above Bentonite chips Bentonite chips	SAMPI	LING	ME	ETHOD	: 1	I0' Sample Barrel		1				
SAMPLES DESCRIPTION NAME (USCS): color, moist, % by w., plast, density, structure, cementation, react, which geo, inter. Surface Elevation: \$81.94 (Gmd.) TOC 564.27 ft. (MSL) Grass, (FILL): SANDY CLAY (CL): dark yellowish brown (10YR 4/4) 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 4/4) 10- 8- 8- 8- 8- 10- 0.1 Same as above NAME (USCS): color, moist, % by w., plast, density, structure, cementation, react, which geo, inter. Surface Elevation: \$81.94 (Gmd.) TOC 564.27 ft. (MSL) For any or any	HAMM	ER V	VEI	GHT:	N.	A DROP: NA		RESPONS	BIBLE PR	OFESSI	ONAL:	•
Grass, [FILL]: SANDY CLAY (CL): dark yellowish brown (10YR 4/4) 4* Diameter Sch. 40 flush-threaded PVC riser with O-rings 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel Cement/bentonite grout 10- 0.1 11*-11.2* clay lens Bentonite chips	PTH eet)				VM ading	NAME (USCS): color, moist, % by wt., plast. dens						ONSTRUCTION
SANDY CLAY (CL): dark yellowish brown (10YR 4/4) 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel Cement/bentonite grout 10- 0.1 11' - 11.2' clay lens Bentonite chips		San	San	용요	Se O			C 564.27 ft.	(MSL)		DRILLI	NG REMARKS
4" Diameter Sch. 40 flush-threaded PVC riser with O-rings 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel Cement/bentonite grout 10- 0.1 11' - 11.2' clay lens Bentonite chips	_		X				(40VD	4/4)	949494949	040494949494949494949494949494949494949		
6- 8- Same as above 10- 0.0 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel Same as above 10- 0.1 11' - 11.2' clay lens Bentonite chips	2-	040201063			0.0	SANDY CLAY (CL): dark yellowish brown	(IUTK	4/4)	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
8- Same as above Same as above 10- 0.0 POORLY GRADED SAND (SP): yellowish brown (107R 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel Same as above 8" Borehole 11' - 11.2' clay lens Bentonite chips	-									4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	flush-threa	ded PVC riser
(10YR 5/4), dry to moist, ~90% fine to medium sand, ~10% gravel 8- 8- 10- 0.1 11' - 11.2' clay lens Bentonite chips Bentonite chips	4-									44444444444444444444444444444444444444	with O-ring	gs
8-	6-				0.0	(10YR 5/4), dry to moist, ~90% fine to med		i				
Same as above 10- 0.1 11' - 11.2' clay lens 12- 0.0 Bentonite chips	-	-									— Cement/bo	entonite grout
10 -	8-									44444444444444444444444444444444444444	— 8" Roreho	le .
12- 0.0	10-				0.1	Same as above			444444444	60606060606060606060606060606060606060	C Borono	
	-					11' - 11.2' clay lens				•	— Bentonite	chips
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	12-				0.0							
14 WELLS	14-								K	\	— Centralize	
Geomatrix Consultants Project No. 7168 Page 1 of 2					7 2	■ Geomatrix Consultants			Project N	lo. 7168		r

PROJECT: Morton Reading FI Log of Well No. UAW01-30 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample No. Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, **DETAILS AND/OR** cementation, react. w/HCI, geo. inter. DRILLING REMARKS POORLY GRADED SAND (SP): continued 0.7 16 0.1 18 Same as above 20 4" Diameter stainless 0.1 steel wraparound screen with 0.020" slots 22-24 #6 Global filter pack 0.1 sand 26-SANDY CLAY (CL) [TILL]: dark grayish brown (5GY 28 4/1), moist, ~70% medium plastic fines, ~30% medium sand and gravel, hard 5.25" End cap Total Depth: 29 feet below ground surface 30 WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morton Rea	eding FI	Log of Well I	No. UAW01-80
BORING LOCATION: ~80	0 ft. W. of Bldg 40	GROUND SURFACE ELEVA 561.91 (Grnd.) TOC 56	
DRILLING CONTRACTOR:	Bowser Morner	DATE STARTED: 4/2/01	DATE FINISHED: 4/3/01
ORILLING METHOD: RO	tasonic	TOTAL DEPTH (ft.): 89.0	SCREEN INTERVAL (ft.): 64.5 - 79.5
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD:	CASING: 4" Diameter PVC
SAMPLING METHOD: 1	0' Sample Barrel	LOGGED BY:	4 Diameter PVC
HAMMER WEIGHT: NA		E. Mansell RESPONSIBLE PROFESSION	'
	DESCRIPTION	M. Hemingway	NA NATH CONSTRUCTION
Cample Sample Sample Sample Sample Blows/ Sample Foot OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, str cementation, react. w/HCl, geo. inter.	ucture,	WELL CONSTRUCTION DETAILS AND/OR
Sal Sal Re	Surface Elevation: 561.91 (Grnd.) TO		DRILLING REMARKS
2- - - 4- - - 8- - 10- - 12-	0'-29' taken from log of UAW01-30 Grass, [FILL]: SANDY CLAY WITH GRAVEL (CL): dark yellow brown (10YR 4/4) 2': black material [asphalt] POORLY GRADED SAND (SP): light olive brow (2.5Y 5/1), dry to moist, ~90% fine to medium sa ~10% gravel		 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings Cement/bentonite grout
14		ি কিন্তু	WELL3
///	Geomatrix Consultants	Project No. 7168	Page 1 of 6

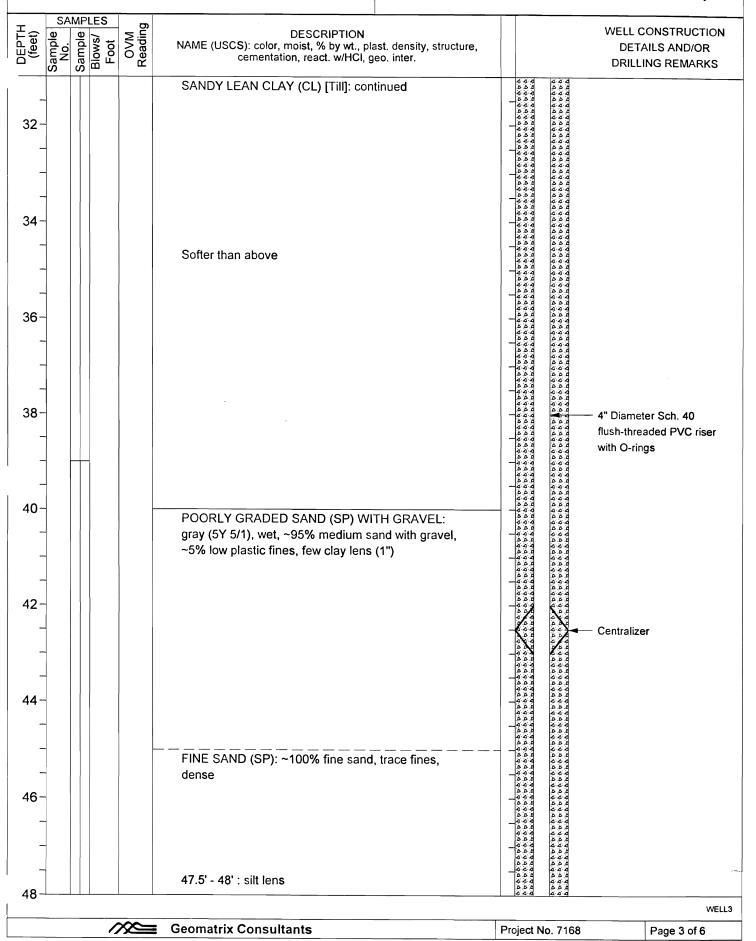
Log of Well No. UAW01-80 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Blows/ Sample No. DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, **DETAILS AND/OR** cementation, react. w/HCl, geo. inter. DRILLING REMARKS POORLY GRADED SAND (SP): continued 16 18 Same as above 20 8" Borehole 22 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings 24 26 28 Cement/bentonite grout 28' 2" to 3" cobbles Very dark gray (5Y 3/1), wet, odor 3.0 29.4' - 29.5' black material, chemical odor SANDY LEAN CLAY (CL) [TILL]: dark greenish gray 0.2 30 (5GY 4/1), moist, ~85% high plastic, ~15% sand and gravel, hard, 29.5' - 29.8' : dark yellowish brown (10YR 4/4) WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 6

PROJECT:

Morton Reading FI

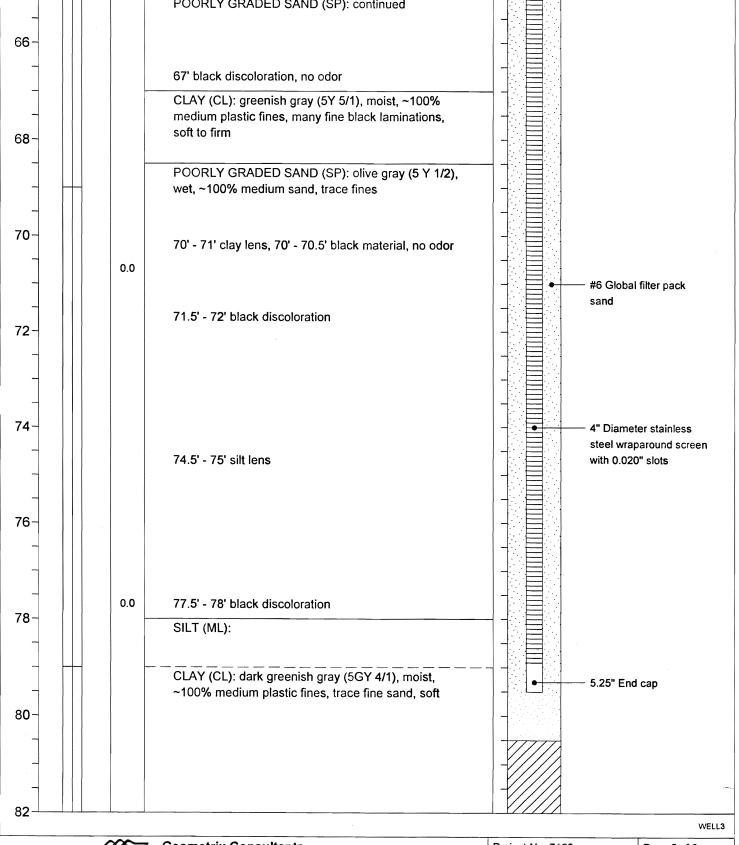
PROJECT: Morton Reading FI

Log of Well No. UAW01-80 (cont'd)



PROJ	ECT:		Morte	on Re	ading FI	l og of Me	II NIG. LIANA	(04.00 / (1.1)
	_					Log of we	II NO. UAVV	(01-80 (cont'd)
DEPTH (feet)	Sample No.	Sample 3	Blows/ Sar	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
50-					CLAY (CL) [TILL]: dark greenish gramoist, ~90% medium to high plastic sand/gravel, firm			
52-				0.0	POORLY GRADED SAND (SP): oli wet, ~100% medium sand, trace fin			
54-								
56-								
58-					Same as above			
60-								
62-								- Bentonite chips
64-								- Centralizer
				<u>~</u>	Geomatrix Consultants		Project No. 7168	Page 4 of 6
					Geomatrix Consultants		FTOJECT NO. /168	Page 4 of 6

PROJECT: Morton Reading FI Log of Well No. UAW01-80 (cont'd) SAMPLES DEPTH (feet)
Sample
No.
Sample
Blows/
Foot WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS POORLY GRADED SAND (SP): continued 66 67' black discoloration, no odor CLAY (CL): greenish gray (5Y 5/1), moist, ~100% medium plastic fines, many fine black laminations, soft to firm 68 POORLY GRADED SAND (SP): olive gray (5 Y 1/2), wet, ~100% medium sand, trace fines 70 70' - 71' clay lens, 70' - 70.5' black material, no odor 0.0 #6 Global filter pack sand 71.5' - 72' black discoloration 72 74 4" Diameter stainless steel wraparound screen 74.5' - 75' silt lens with 0.020" slots



Geomatrix Consultants

Project No. 7168

Page 5 of 6

PROJE	ECT: M	orton Re	ading FI			
				Log of We	ell No. UAW01-8	30 (cont'd)
DEPTH (feet)	Sample No. Sample Blows/	Foot %	DESCRIPTION NAME (USCS): color, moist, % by wt., p cementation, react. w/HCl, g	ast. density, structure, geo. inter.		ELL CONSTRUCTION DETAILS AND/OR RILLING REMARKS
_			CLAY (CL): continued			orehole onite chips
84						
86-					4" Bo	orehol e
88-			POORLY GRADED SAND (SP): da (10Y 4/1), wet, ~100% medium san gravel Total Depth: 89 feet below ground s	d, trace fine		
90-						
92-						
94 -						
96 -						
98-						
		/XC=	■ Geomatrix Consultants		Project No. 7168	Page 6 of 6
1		· / /	- Ocomutin Consultants		1 10 COL 140. / 100	Fage 0 01 0

PROJE C T:	Morton Ke			No. UAW02-20
BORING LOCA	ATION: 8'	S. of STR07	GROUND SURFACE ELEY	
			551.99 (Grnd.), (TOC	DATE FINISHED:
ORILLING CO	NTRACTOR:	Bowser Morner	3/21/01	3/21/01
RILLING ME	THOD: R	otasoni c	TOTAL DEPTH (ft.): 19.0	SCREEN INTERVAL (ft.): 8 - 18
RILLING EQ	UIPME NT :	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD:	CASING: 4" Diameter PVC
AMPLING M	ETHOD:	10' Sample Barrel	LOGGED BY:	4 Diameter FVC
IAMMER WE			E. Mansell RESPONSIBLE PROFESS	· ·
SAM	PLES	DESCRIPTION	M. Hemingway	NA NA
(feet) Sample No.	Blows/ ST Foot OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, scementation, react. w/HCI, geo. inter.	structure,	WELL CONSTRUCTION DETAILS AND/OR
Sar Sar	B F S		(TOC) 551.58 ft. (MSL)	DRILLING REMARKS
		Asphalt [FILL]	44	- Well Vault
7				— 12" Steel traffic cover set in concrete
4 1	 	CLAY (CL) [FILL]: dark brown to black ~05%	444444444444444444444444444444444444444	in concrete
		CLAY (CL) [FILL]: dark brown to black, ~95% medium plastic fines, ~5% sand, trace gravel,	iron 1944 1944	
		laminations	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
2-			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	— Cement/bentonite grout
4 1			A A A A A A A A A A A A A A A A A A A	
				— 4" Diamet er
7			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	flush-threaded Sch. 40
4				PVC casing with O-rings
4-			<u> </u>	
.				
7				
4	\square			Bentonite chips
		GRAVEL WITH CLAY (GP-GC): tan mottling,		
7		moist to wet, ~80% gravel, 1" to 2" ~20% med plastic fines, trace medium sand		
6-		piastic fines, trace medium sand		
7		POORLY GRADED SAND with GRAVEL (SP)): dark	— Centraliz er
4		grayish brown (7.5Y 4/2), wet, ~90% medium s		
8-		~10% fine gravel, silt lens 7.5 - 8'		
07				
-				
1	\sqcup			
7				
10-				
7				
-				
40				4" Diameter
12-				continuous-wrap
12				stainless steel screen
12-				
12-				with 0.020" slots
12-				with 0.020" slots
14				with 0.020" slots

PROJECT: Morton Reading FI Log of Well No. UAW02-20 (cont'd) SAMPLES OVM Reading DEPTH (feet) WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. DETAILS AND/OR DRILLING REMARKS POORLY GRADED SAND with GRAVEL (SP): continued 15 - 17' black staining 16 #6 Global filter pack 0.5 LEAN SANDY CLAY (CL): [TILL]: dark greenish gray (10Y 4/1), moist, ~90% high plastic fines, ~10% 5.25" End cap medium sand, trace fine gravel 18 Bentonite chips Total Depth: 19 feet below ground surface 20 22 24 26 28 30 WELL3 1780 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morton Reading FI		Log of Well	No. UAW02-40
BORING LOCATION: 16' South of	GROUND SURFACE ELEVATION AND DATUM: 551.91 (Grnd.) TOC 551.58 ft. (MSL)		
DRILLING CONTRACTOR: Bowser	DATE STARTED: 3/21/01	DATE FINISHED: 3/22/01	
DRILLING METHOD: Rotasonic		TOTAL DEPTH (ft.): 47.0	SCREEN INTERVAL (ft.): 31.5 - 46.5
DRILLING EQUIPMENT: 8" Diamet	er outer/4" Diameter inner casing	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC
SAMPLING METHOD: 10' Sample	Barrel	LOGGED BY: E. Mansell	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSI M. Hemingway	ONAL: REG. NO. NA
	DESCRIPTION ISCS): color, moist, % by wt., plast. density, stri cementation, react. w/HCI, geo. inter.	ucture,	WELL CONSTRUCTION DETAILS AND/OR
Cfee (fee (fee (fee (fee (fee (fee (fee	Surface Elevation: 551.91 (Grnd.) TO	C 551.58 ft. (MSL)	DRILLING REMARKS
plastici lamina 4- 4- 6- GRAVI ~80% trace n POOR grayish	(CL) [FILL]: dark brown, ~ 95% medium ty fines, ~5% sand, trace gravel, iron	es, विजय क्षेत्रक क्	Well Vault 12" Steel traffic cover set in concrete 4" Diameter Sch. 40 flush-threaded PVC casing with O-rings — Centralizer
			-
14 Geomat	rix Consultants	Project No. 7168	Page 1 of 3

			Log of Wel	II No. UAW02-4	0 (cont'd)
DEPTH (feet)	Sample Blows/ Sample COVM COVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pl cementation, react. w/HCl, g	ast. density, structure, geo. inter.	DI	L CONSTRUCTION ETAILS AND/OR ILLING REMARKS
-		POORLY GRADED SAND with GR continued	AVEL (SP):	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
16-		16' - 18' black material		100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
18-		LEAN SANDY CLAY (CL) [TILL]: da (10Y 4/1), moist, ~90% medium pla medium sand, trace fine gravel, har	stic fines, ~10%	44444444444444444444444444444444444444	
20-		20' 4" cobbles, fossiliferous			ehole
24-					
26-	_	WELL GRADED SAND (SW): dark (10Y 4/1), wet, ~95% gravel, ~5% s		1444 9444444444444444444444444444444444	
28- - - - 30-		29' - 29.8' clay lens		Bentor	nite chips
	//%=	Geomatrix Consultants		Project No. 7168	Page 2 of 3
L					1 090 2 01 0

PROJECT:

Log of Well No. UAW02-40 (cont'd) SAMPLES OVM Reading Sample No. Sample Blows/ Foot WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS WELL GRADED SAND (SW): continued Centralizer 32 34 4" clay lens 36 4" clay lens 38 Same as above 40 4" Diameter continuous-wrap stainless steel screen with 0.020" slots 42 #6 Global filter pack sand CLAY (CL): greenish gray (10Y 5/1), moist, ~100% 46 high plastic fines, trace fine sands, weak bedding, few black laminations, soft, no odor 5.25" End cap Total Depth: 47 feet below ground surface 48 WELL3 **Geomatrix Consultants** Project No. 7168 Page 3 of 3

PROJECT:

PROJECT: Morton R	eading FI	Log of Well	No. UAW03-20
BORING LOCATION: ~	70 ft. Northwest of Circle	GROUND SURFACE ELEV 552.20 (Grnd.) TOC 5	
DOLLING CONTRACTOR:	Bowser Morner	DATE STARTED:	DATE FINISHED:
DRILLING CONTRACTOR:	DOWSEL MOTHER	3/23/01	3/23/01
DRILLING METHOD: F	Rotasonic	TOTAL DEPTH (ft.): 19.0 DEPTH TO WATER ATD:	SCREEN INTERVAL (ft.): 9 - 19 CASING:
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	NA	4" Diameter PVC
SAMPLING METHOD:	10' Sample Barrel	LOGGED BY: E. Mansell	
	IA DROP: NA	RESPONSIBLE PROFESS M. Hemingway	ONAL: REG. NO. NA
Ceet) Sample Sample No. Sample Blows/ Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, s cementation, react. w/HCl, geo. inter.	structure,	WELL CONSTRUCTION DETAILS AND/OR
Sar Sar Pic	Surface Elevation: 552.20 (Grnd.)	OC 551.96 ft. (MSL)	DRILLING REMARKS
-	Asphalt	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Well Vault — 12" Steel traffic cover set in concrete
2-	SANDY CLAY (SC)	44949494949494 24949494949494 249494949494 249494949494 249494949494	— Cement/bentonite grout
		444 • 444 444 444 444 444	 4" Diameter Sch. 40 flush-threaded PVC
4-	Iron colored mottling	च्यक्तम्यव्यव्यव्यव्यव्यव्यव्यव्यव्यव्यव्यव्यव्	casing with O-rings
6-	SAND (SP): wet		— Bentonite chi ps
8-			— Centralizer
10-			 4" Diameter continuous-wrap stainless steel screen with 0.020" slots
12-			— #6 Global filter pack sand
14			WEL
/%	Geomatrix Consultants	Project No. 7168	Page 1 of 2

						Log of Wel		No. UAW	03-20	(cont'd)
DEPTH (feet)	Sample S No.	Sample 7	Blows/ G Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	ast. density, structure, eo. inter.			DETA	ONSTRUCTION AILS AND/OR NG REMARKS
-					SAND (SP): with gravel		-			
16-	-				15.5' - 17' black staining				- 8" Boreho	le
18-					LEAN CLAY (CL) [TILL]		-		- 5.25" End	
					Total Depth: 19 feet below ground s	surface	-			
20-										
-	-						-			
-							-			
-	-						-			
22-							_			
-							-			
24-										
-							-			
-	-						-			
-	-						-			
26-							-			
-							-			
-							-			
28-										
							_			
-							-			
-	4						-			
30-							-			
-							-			, many
_							1			WELL3
			1	% =	Geomatrix Consultants		Pro	ject No. 7168		Page 2 of 2

PROJECT:

PROJECT: Mor	ton Reading FI		Lo	g of Well I	No. UAW04-20
BORING LOCATION	: 150' South	west of Fuel Tank		SURFACE ELEVA	ATION AND DATUM:
DRILLING CONTRA	CTOR: Bows	er Morner	DATE STA		DATE FINISHED:
			3/23/01 TOTAL DE	EPTH (ft.):	3/23/01 SCREEN INTERVAL (ft.):
DRILLING METHOD	: Rotasonic		19.0		9- 19
ORILLING EQUIPME	ENT: 8" Dian	neter outer/4" Diameter inner casing	NA DEPTH TO	O WATER ATD:	CASING: 4" Diameter PVC
SAMPLING METHO	D: 10' Samı	ple Barrel	LOGGED		
		DROP: NA	E. Mans	SIBLE PROFESSI	ONAL: REG. NO.
SAMPLES			M. Hem	ingwa y	NA
E a a	NAME Seading	DESCRIPTION E (USCS): color, moist, % by wt., plast. density, so cementation, react. w/HCl, geo. inter.	tructure,		WELL CONSTRUCTION DETAILS AND/OR
Sa Sa		Surface Elevation: 552.44 (Grnd.) T	OC 552.19 ft.	(MSL)	DRILLING REMARKS
	Asp	halt		4 4 4	Well Vault - 12" Steel traffic cover set
				4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	in concrete
1 1	LEA	AN CLAY (CL): dark brown			
7					
2-				444	- Cement/bentonite grout
-				_ 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
_				4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	- 4" Diameter Sch. 40
				444 444	flush-threaded PVC
4				100 DAG 100 DAG 100 DAG	casing with O-rings
-	San	ne as abo ve		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
6-	Iron	n colored mottling			- Bentonite chips
8-		comes darker in color me as above		-	– Centraliz e r
-					
10 - 55000000000000000000000000000000000	WE	ELL GRADED SAND (SW):			#6 Global filter packsand
	11'	' - 11.6' Silt lens			
12-	11.3	8' - 13.7' black staining			- 4" Diameter continuous-wrap stainless steel screen with 0.020" slots
-	I FA	AN CLAY (CL) [TILL]			
14		(32) [(122]			WELL
	/% Geor	matrix Consultants		Project No. 7168	Page 1 of 2

ROJECT: I	Morton Kea	aing Fi	Log of Well No. UAW04-20 (cont'd)					
Sample No.	Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plas cementation, react. w/HCl, ge	st. density, structure, o. inter.	DETAI	NSTRUCTION LS AND/OR G REMARKS			
16-		LEAN CLAY (CL) [TILL]: continued		8" Borehole				
				● 5.25" End c	ар			
-		Total Depth: 19 feet below ground su	ırface					
20-								
-				-				
		•						
22-								
-								
-				-				
24-								
-								
-			•					
-				-				
26-								
28-				_				
				-				
-				-				
30-								
					· WE			
	/X	Geomatrix Consultants	1	Project No. 7168	Page 2 of 2			

ROJECT: Morton Rea	aing FI	Log of Well No	
ORING LOCATION: ~70) ft. W S.W. of Bldg. 32	GROUND SURFACE ELEVATION 553.78 (Grnd.) TOC 553.	
RILLING CONTRACTOR:	Bowser Morner	DATE STARTED:	ATE FINISHED:
			/23/01 CREEN INTERVAL (ft.):
RILLING METHOD: Rot	tasonic	19.0	- 17
RILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing		ASING: " Diameter P VC
AMPLING METHOD: 10	O' Sample Barrel	LOGGED BY:	Diameter FVC
AMPLING METHOD: 10	0' Sample Barrel	E. Mansell RESPONSIBLE PROFESSION	AL: REG. NO.
AMMER WEIGHT: NA	DROP: NA	M. Hemingway	NA REG. NO.
Sample No. Sample Blows/ Foot COVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR
San San Fc	Surface Elevation: 553.78 (Grnd.)	TOC 553.47 ft. (MSL)	DRILLING REMARKS
	LEAN CLAY (CL) [FILL]: black (2.5Y 2.5/1)	4 4 V	/ell Vault
-			2" Steel traffic cover set
			concret e
032301046			ement/bentonite grout
2-			" Diameter Sch. 40
		[8:3:3] [8:3:3]	ush-threaded PVC riser
		8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	rith O-rings
-		7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
-			
4-			
-			
			Sentonite chips
	Dark brown		
6-			
-			
-	POORLY GRADED SAND (SP): moist, ~90%		
	medium sand, ~10% gravel		
8-			" Borehole
$\neg \mid / \setminus \mid \mid \mid$			
-			
10-			6 Global filter pack
-			and
_			
12-	10.5' - 13.5' black staining		" Diameter wraparound stainless steel screen
-	-		vith 0.020" slots
032301047	LEAN CLAY (CLATTILL)		
0323	LEAN CLAY (CL) [TILL]:		
14			WE

PROJE	CT:	Mort	on Kea	ading FI	l og of Well N	No LLAVA)5 20 (ac wild)
					Log of well f	NO. UAVV	05-20 (cont'd)
DEPTH (feet)	Sample No.	Sample Hall Blows/ Mark Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plate cementation, react. w/HCl, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
1				LEAN CLAY (CL) [TILL]: continued			
16-						•	5.25" End cap
_				•			
18-						////	Bentonite chips
-							
_			_	Tabel Barella 40 facility			
_				Total Depth: 19 feet below ground s	urface		
20-							
_							
_							
				A STATE OF THE STA			
22-							
_							
-					-		
_					-		
24-					-		
-					-		
-					-		
_					-		
26-							
_							
-							
_							
28-							
-							
30-					-		
-					-		-mag.

Geomatrix Consultants

Project No. 7168

Page 2 of 2

ROJECT:	:	1/	/IOrt	on Kea	ding FI		Log of Well No. UAW06-20
ORING L	OC.	ΑT	ION:	~1:	20 ft. S.W. of Bldg 30, S.E. of French Drain		ROUND SURFACE ELEVATION AND DATUM: 53.51 (Grnd.) TOC 553.25 ft. (MSL)
RILLING	СО	NT	RAC	TOR:	Bowser Morner	DA	ATE STARTED: DATE FINISHED: /26/01 3/27/01
RILLING	ME	ТН	OD:	Ro	tasoni c	ТО	OTAL DEPTH (ft.): SCREEN INTERVAL (ft.): 9.0 9 - 19
RILLING	EQ	UIF	PME	NT:	8" Diameter outer/4" Diameter inner casing	DE	EPTH TO WATER ATD: CASING:
AMPLINO	~ NA		HOD		O' Sample Barrel	LO	IA 4" Diameter PVC OGGED BY:
					·		. Mansell ESPONSIBLE PROFESSIONAL: REG. NO
AMMER '				NA			1. Hemingway NA
क् ब	ON S	Sample		OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.	structur	DETAILS AND/OR
Sar	2 0	Sa -	<u> </u>	28	Surface Elevation: 553.51 (Grnd.)	TOC 55	53.25 ft. (MSL) DRILLING REMARKS
					Cement		Well Vault
					Gravel, base material		and and in concrete
2 - 2				0.6	CLAY (CL) [FILL]: dark greenish black (10Y 2 moist, hard, ~95% medium plastic fines, ~5% sand Very dark greenish brown (2.5Y 3/2)		SPECTOR STATE OF SPECTOR SPEC
-					very dank greenish blown (2.51 5/2)		4" Diameter Sch. 40 444 flush-threaded PVC riser 444 with O-rings
4-				0.6			Total appropriate the control of the
6-					Same as above		
8-				2.5			Bentonite chips
					WELL GRADED SAND (SW): black, wet, che	emical	3" 8" Borehole
10-				5.0 10.7	odor		
032601060				4.1			4" Diameter satinless steel wraparound screen
12 - 8					LEAN SANDY CLAY (CL) [TILL]:		with 0.020" slots
14							W
			/	%	Geomatrix Consultants		Project No. 7168 Page 1 of 2

PROJECT: Morton Reading FI Log of Well No. UAW06-20 (cont'd) **SAMPLES** OVM Reading Cfeet)
Sample
No.
Sample
Blows/
Foot WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS LEAN SANDY CLAY (CL) [TILL]: continued 10.9 16-#6 Global filter pack sand 18 1.7 5.25" End cap Total Depth: 19 feet below ground surface 20 22 24 26 28-

30 WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT: Morton R	eading FI	_	No. UAW07-20
BORING LOCATION:	N.W. Corner of Plant	GROUND SURFACE ELEV 554.66 (Grnd) TOC 55	
		DATE STARTED:	DATE FINISHED:
DRILLING CONTRACTOR:	Bowser Morner	3/25/01	3/25/01
DRILLING METHOD:	Rotasoni c	TOTAL DEPTH (ft.): 19.0	SCREEN INTERVAL (ft.): 9 - 19
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC
SAMPLING METHOD:	10' Sample Barrel	LOGGED BY: E. Mansell	
	NA DROP: NA	RESPONSIBLE PROFESS M. Hemingway	IONAL: REG. NO. NA
Cfeet) Sample No. No. Blows/ Sample Coot	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.	tructure,	WELL CONSTRUCTION DETAILS AND/OR
Sa Sa	Surface Elevation: 554.66 (Grnd) TO	OC 554.32 ft. (MSL)	DRILLING REMARKS
2-	SANDY LEAN CLAY (CL) [FILL]:	0 100 110 110 110 110 110 110 110 110 1	Well Vault 12" Steel traffic cover set in concrete Cement/bentonite grout
4-		र्यस्य प्रमुम्य प्रमुम्य स्थाप्त स्थापत स्यापत स्थापत स्यापत स्थापत स्	— 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings
6-	SILTY SAND (SM): black staining at 5.5' - 13.5' chemical odor	19 29 29 29 29 29 29 29 29 29 29 29 29 29	— Bentonite chips
8-	Abundant graval		— 8" Borehole
10-	Abundant gravel		— #6 Global filter pack sand
12-	POORLY GRADED SAND (SP):		4" Diameter stainless steel wraparound screen with 0.020" slots
-	LEAN CLAY (CL) [TILL]:		
14			WEI
			VVC1

PROJECT: Morton Reading FI Log of Well No. UAW07-20 (cont'd) SAMPLES OVM Reading Ceet)
Sample
No.
Sample
Blows/
Foot WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR DRILLING REMARKS** LEAN CLAY (CL) [TILL]: continued 16 18 5.25" End cap Total Depth: 19 feet below ground surface 20 22 24 26 28 30-

WELL3

Geomatrix Consultants

Project No. 7168

Page 2 of 2

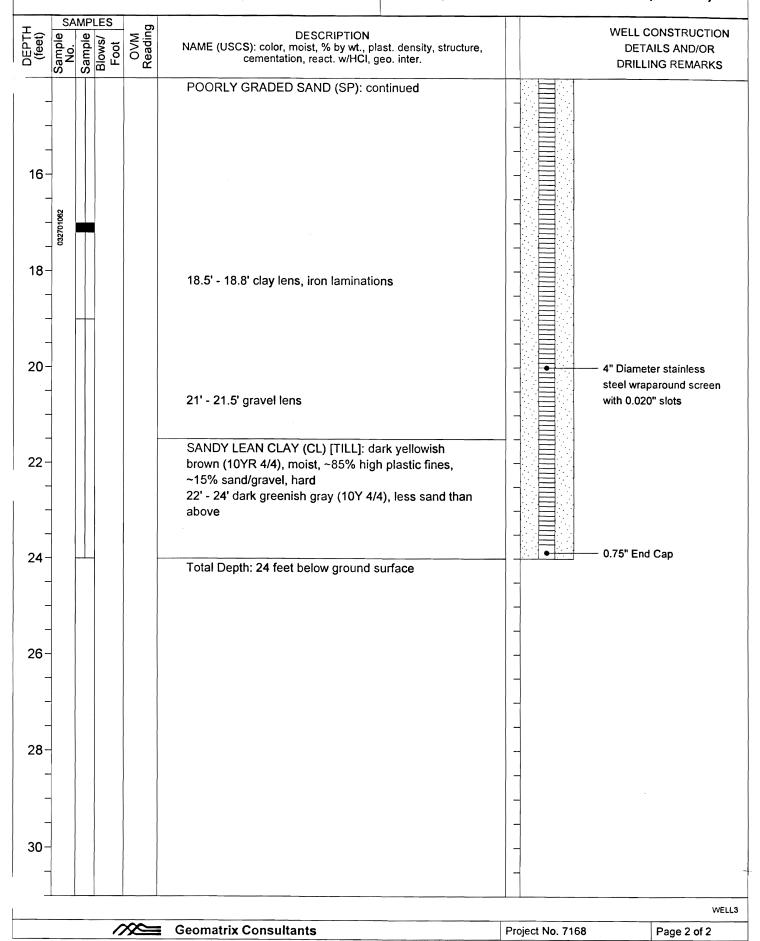
ROJECT:	M	orto 	n Rea	ading FI			g of Well		
ORING LO	CATIC	N:	~7	0 ft. W. of Bldg. 32			SURFACE ELEV. Grnd.) TOC 5		
			.00	Davis on Marin -		DATE STA		DATE FIN	
RILLING C	UNTR	ACT	UK:	Bowser Morner		3/24/01		3/25/01	
RILLING M	METHO	D:	Ro	tasonic		TOTAL DE 19.0		9 - 19	INTERVAL (ft.):
RILLING E	QUIPN	MEN.	T:	8" Diameter outer/4" Diameter inner casir	ng	NA	O WATER ATD:	CASING: 4" Diam	eter PVC
AMPLING	METH	OD:	1	0' Sample Barrel		LOGGED E. Mans	ell	ONIAL	
IAMMER W			N.A		1	M. Hem	SIBLE PROFESSI ingway	ONAL:	REG. NO.
Cfeet) Sample No.	Sample Na Blows/		OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. den cementation, react. w/HCI, geo. inte	sity, struc r.	cture,		DETA	ONSTRUCTION AILS AND/OR
Sar Sar	Sal	ű.	~ ~	Surface Elevation: 554.55 (Gr	nd.) TOC	554.20 ft.	(MSL)	DRILLI	NG REMARKS
				0'-19' taken from log STR03			4	Well Vaul	
			-	Concrete			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		traffic cover set
4 }			-	Base, gravel	0.540		1 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	in concret	е
				SANDY CLAY (CL): greenish black (10Y 2		r y	444 444	- Camanil	entonite grout
				to moist, ~20% fine sand, ~80% low plasti hard, strong chemical odor	ic ines,		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Cemendo	emonite grout
2-				nara, suong chemical buol			_444 444 444 444		
4	\ /						_ A A A A A A A A A A A A A A A A A A A		
	$ \setminus $						444	49.50	0 1 10
7	$ \setminus $						444		er Sch. 40
-								with O-rin	aded PVC riser
4-							444	With O-III	gs .
•	/ \			Black staining at 4 ft.			444 444		
-	/ \			SILTY SAND (SM): greenish black		•	444444444444444444444444444444444444444		
6-				SANDY CLAY (CL): black, wet, ~30% fine sand, ~70% low plastic fines	to medi	ium	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
8-	X							— 8" Boreho	ole
10-				10.5' - 19.5' black staining, strong chemic	al odor				
-				2.22 2.22. 2.2					
+				POORLY GRADED SAND with GRAVEL	(SP-SM	I)·			
4				black, moist, ~90% coarse sand, ~10% lo	•	•			
12-				fines, chemical odor	plastic	-			
1053									
032401053			}				-	— 4" Diame	ter stainle ss
-				LEAN SANDY CLAY (CL) [TILL]: olive (5\	Y 5/4) ~8	30%		steel wrap with 0.020	oaround screen O" slots
14			^^						WEL
		_//	%	Geomatrix Consultants			Project No. 7168		Page 1 of 2

		Ü	Log	Log of Well No. UAW08-20 (cont'd)		
DEPTH (feet) Sample	Sample Blows/ San Foot	Reading ceme	DESCRIPTION lor, moist, % by wt., plast. density, str ntation, react. w/HCl, geo. inter.	ucture,	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS	
			plastic fines, ~20% medium sand	land		
		fine gravel, har	d, some black staining			
16-		Same as above	}			
				- -	 #6 Global filter pack sand 	
-					Saliu	
18-						
					− 5.25" End cap	
		Total Depth: 19	feet below ground surface			
20-						
22-						
, 1						
24-						
				17		
26-				7		
				17		
20						
28-				[]		
				17		
30-						
					WELL3	
	17.	Geomatrix Con	sultant s	Project No. 7168	Page 2 of 2	

PROJECT:

PROJECT: Morton Re	ading FI	Log of Well	No. UAW09-20
BORING LOCATION: S.	of Parking Lot	GROUND SURFACE ELEV 563.64 (Grnd) TOC 56	
DRILLING CONTRACTOR:	Bowser Morner	DATE STARTED: 3/27/01	DATE FINISHED: 3/27/01
DRILLING METHOD: R	otasonic	TOTAL DEPTH (ft.): 24.0	SCREEN INTERVAL (ft.): 9 - 24
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD: 12'	CASING: 4" Diameter PVC
SAMPLING METHOD:	10' Sample Barrel	LOGGED BY: E. Mansell	
HAMMER WEIGHT: N	A DROP: NA	RESPONSIBLE PROFESS M. Hemingway	IONAL: REG. NO.
DEPTH (feet) Sample No. Sample Sample Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, str		WELL CONSTRUCTION
Sample Root CovM Reading	cementation, react. w/HCl, geo. inter. Surface Elevation: 563.64 (Grnd) TO	C 565 91 ft. (MSL)	DETAILS AND/OR DRILLING REMARKS
-	Grass	44 44 44 44 44 44 44 44 44 44 44 44 44	
2-	CLAYEY SAND (SC) [FILL]: dark yellowish brow (10YR 3/6), moist, firm, few roots	(n	— Cement/bentonite grout
4-	DOORLY CRADED SAMD (SD) light alive brown	4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -	 4" Diameter Sch. 40 PVC flush-threaded riser with O-rings
6-	POORLY GRADED SAND (SP): light olive brow (2.5Y 5/4), moist, ~85% medium fine sand, ~15% plastic fines, trace gravel		— Bentonite chips
8-			— Centralizer
10-	Less silt than above		— 8" Borehole
14			WELL3
///	■ Geomatrix Consultants	Project No. 7168	Page 1 of 2

Log of Well No. UAW09-20 (cont'd)



PROJECT: Morton Re	ading FI	Lo	g of Well I	No. UAW09-60
BORING LOCATION: S.	of Parking Lot			ATION AND DATUM: 66.32 ft. (MSL)
DRILLING CONTRACTOR:	Bowser Morner	DATE STA 3/27/01	ARTED:	DATE FINISHED:
DRILLING METHOD: RO	otasonic	TOTAL DE	EPTH (ft.):	3/28/01 SCREEN INTERVAL (ft.):
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing		O WATER ATD:	47 - 57 CASING:
		NA LOGGED	BY:	4" Diameter PVC
	10' Sample Barrel	E. Mans		ONAL: REG. NO.
HAMMER WEIGHT: N		M. Hem		NA. REG. NO.
Sample No. Sample Blows/ COVM COVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.	structure,		WELL CONSTRUCTION DETAILS AND/OR
Sa S	Surface Elevation: 563.64 (Grnd.)	TOC 566.32 ft.	(MSL)	DRILLING REMARKS
2- - - 4- - - - - - - - - - - - 10- - - - 12- - - - - - - - - - - - - - -	0'-24' taken from log of UAW 09-20 Grass/topsoil CLAYEY SAND (SC) [FILL]: dark yellowish bro (10YR 3/6), moist, firm, few root POORLY GRADED SAND (SP): light olive bro (2.5Y 5/4), moist, ~85% medium fine sand, ~1 plastic fines, trace gravel Same as above			- 8" Borehole - 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings
//X=	Geomatrix Consultants		Project No. 7168	Page 1 of 4
	_ Community Consultants		. 10,000 140. 7 100	Faye 1 01 4

:_		MPLE		_ gc	DESCRIPTION			WELL CONSTRUCTION
(feet)	Sample No.	Sample Blows/	Foot	OVM	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.	ructure,		DETAILS AND/OR DRILLING REMARKS
					POORLY GRADED SAND (SP): continued	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4 4 4	
							1949	
_							4 4 4 4 4 4	
_							4 4 4 4 4 4	
6-						_ a a a a a a a a a	4 4 4 4 4 4 6 4 4	
-	-						0 0 0 0 0 0	
-							0 0 0 0 0 0	
_						- 444 - 444 - 444 - 444	4 0 4 0 4 0 4 0	
8-	-					9 4 4 8 4 8 9 4 8 8	4 4 4 4 4 4 4 4 4	
_						444	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
_		+				444	1444	
_						2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4 4 4 4 4 4	
0-						8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0 0 0 0 0 0 0 0 0	
_						2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	
_					LEAN SANDY CLAY (CL) [TILL]: dark yellowish brown (10YR 4/4), moist, ~85% high plastic fines	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	0 0 0 0 0 0 0 0 0	
_					~15% sandy gravel, hard	, a d d a d d	444	
2-					21.5' : dark greenish gray (10Y 4/4)	4444	0 0 0 0 0 0 0 0	
							4 4 4 4 4 4 4 4 4 4 4 4	
_							4 4 4 4 4 4 4 4 4	
_							444	
_						- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
4-						- 4444 4444	2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
							444	
-					2" - 3" fossiliferous cobbles at 25'	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	444	
							444	— Centralizer
6-						- 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 4 4 0 4 4 0 4 4	
-						4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0 0 0 0 0 0	
-						- 4 4 4 - 4 4 4 - 4 4 4	4 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
_						4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4 4 4 4 4 4	
8-						4 4 4 4 4 4 4 4 4 4 4 4	444	
_	-					4444	444	
_						444	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
_					Same as above	444	444	
^						444 444 444	9 4 4 4	
0-							444	
_	1						144444 14444 14444	

Project No. 7168

Page 2 of 4

Geomatrix Consultants

Morton Reading FI PROJECT: Log of Well No. UAW09-60 (cont'd) **SAMPLES** WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. DETAILS AND/OR DRILLING REMARKS LEAN SANDY CLAY (CL) [TILL]: continued 32 36 Becomes softer Cement/bentonite grout 38 SILT (ML): dark gray (5Y 4/1), moist, hard, 100% low plastic fines SILTY SAND (SM): olive brown (2.5Y 4/3), wet, ~90% fine sand, ~10% fines, silt lens Bentonite chips Centralizer POORLY GRADED SAND (SP): olive brown (2.5Y 4/3), wet, 100% fine medium sand, trace fines 48 WELL3 **Geomatrix Consultants** Project No. 7168 Page 3 of 4

		Log of Well No. UAW09-60 (cont'd)				
Sample No. Sample No. Sample No. Sample Blows/ Sample Coot Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCI, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS		
50- - - - 52- - - 54-	SILT (ML): grayish brown (2.5Y 5/2) brown (2.5Y 5/6) mottling, moist, 10 fines, trace fine sand, hard POORLY GRADED SAND (SP): light (2.5Y 5/4), wet, 100% fine sand, 4" (0% low plastic		8" Borehole 4" Diameter stainless steel wraparound screen with 0.020" slots		
56-	LEAN CLAY (CL) [TILL]: greenish g moist, hard, 95% high plastic fines,			#6 Global filter pack sand 0.75" End cap Bentonite chips		
60-	58.5' - 58.7' Poorly graded sand Total Depth: 59 feet below ground s	urface		4" Borehole		
64-			-	WELL3		
/ /	Geomatrix Consultants	F	Project No. 7168	Page 4 of 4		

PROJECT: Mo	rton Read	ding FI	Log	g of Well N	No. UAW10-50
BORING LOCATION	N: N.E	. Corner of Plant	1	SURFACE ELEVA Grnd.) TOC 57	TION AND DATUM:
DA DA				RTED:	DATE FINISHED:
ORILLING METHOL		asonic	8/21/01 TOTAL DE	PTH (ft.):	8/22/01 SCREEN INTERVAL (ft.):
		·	60.0 DEPTH TO	WATER ATD:	47-57 CASING:
RILLING EQUIPM	ENT: (Gussbach Sonic	43'	nv.	4" Diameter PVC
AMPLING METHO	DD: 10	O' Rotasonic Core	T. Jennir	ng s	
IAMMER WEIGHT	: NA	DROP: NA	RESPONS M. Hemir	IBLE PROFESSION	DNAL: REG. NO. NA
(feet) (Sample No. Sample Blows/	Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter.	, structure,		WELL CONSTRUCTION DETAILS AND/OR
San San Blo	요 ~ _) TOC 577.77 ft. ((MSL)	DRILLING REMARKS
2-	0.0	Fill Material CLAYEY SAND (SC): dark brown, wet, ~85% ~10% clay and poorly graded fine to medium ~5% pebbles, slighty firm, loose, few calcare pebbles,	sand,	100 100 100 100 100 100 100 100 100 100	Well Vault - 12" Steel traffic cover set in concrete - 8" Borehole
4-	0.0			\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	- Cement/bentonite grout
6-	0.0	GRAVELLY SANDY CLAY (CL): light brown	, damp,	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
-		~75% clay with ~20% medium sand, and ~5	% gravel,	1 4 4 • 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	 4" Diameter Sch. 40 flush-threaded PVC riser
-	0.0	slightly plastic		444	with O-rings
8-	0.0			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
		CLAY (CH): grayish brown, damp, stiff, plast slightly mottled with dark gray clay	ic,		
10-	0.0	Same as above but becomes gray with sligh		44444444444444444444444444444444444444	
12-	0.0	PID readin g)			
-	0.0				
14		· · · · · · · · · · · · · · · · · · ·		IN DA IN A A	WEL

Μοποη Reading FI PROJECT: Log of Well No. UAW10-50 (cont'd) SAMPLES OVM Reading DEPTH (feet)
Sample No.
Sample Blows/ Foot WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR DRILLING REMARKS** CLAY (CH): continued 0.0

16 0.0 18-Centralizer 20 22 0.0 24 8" Borehole Same as above 26 28 0.0 30 WELL3

Project No. 7168

Page 2 of 4

Geomatrix Consultants

Log of Well No. UAW10-50 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. DETAILS AND/OR DRILLING REMARKS CLAY (CH): continued 32 0.0 Same as above 36 38 0.0 SANDY CLAY (CL): grayish brown, wet, ~50% clay with ~50% fine sand, slightly plastic, soft CLAY (CH): yellowish brown, damp, very stiff, very plastic 40 GRAVELLY SANDY CLAY (CL): yellowish brown, stiff, ~70% clay, ~20% fine to medium sand, ~10% 42 fine (<1/4") gravel, moderately plastic Bentonite chips 0.0 SAND (SP): brown, wet to saturated, medium grained to fine, loose 46 16-30 Sand WELL3 **Geomatrix Consultants** Project No. 7168 Page 3 of 4

PROJECT:

PROJECT:	Morton Rea	ading FI		
			Log of Well N	No. UAW10-50 (cont'd)
	Sample di Blows/ grade Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, eo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
50- 52- 54-	0.0	GRAVELLY SANDY CLAY (CL): broclay with ~10% fine sand, and ~5% moderately plastic, stiff GRAVELLY SAND (SW): brown to saturated, ~90% sand fine to mediu ~10% fine to very coarse gravel (<1)	fine gravel, dark brown, m grained with	4" Diameter stainless steel wraparound screen with 0.020" slots Centralizer
58-	0.0	GRAVELLY SANDY CLAY (CL): greater dark green, dry to damp, ~70% clar to coarse grained sand, ~10% grav diameter (granitic), nonplastic to sliglacial till, very hard	y, ~20% very fine el locally <1/4"	6" Stainless steel end cap Bentonite hole plug
60-		Total Depth: 60 feet below ground s	urface	

Geomatrix Consultants

Project No. 7168

Page 4 of 4

PROJECT: Morton	Reading FI		Log of V	Well No	o. UAW1	0-80
BORING LOCATION:	N.E. Corner	of Plant; ~6' E. of UAW10-50	GROUND SURFAC 578.27 (Grnd.)			JM:
DRILLING CONTRACTO	DR: Boart L	ongyear	DATE STARTED: 9/5/01		ATE FINISHE	D:
DRILLING METHOD:	Rotasonic		TOTAL DEPTH (ft.) 87.0	: S	CREEN INTE	RVAL (ft.):
DRILLING EQUIPMENT	: Gussbac	h Sonic	DEPTH TO WATER	RATD: C	ASING: I" Diameter	PVC
SAMPLING METHOD:	6" X 10' C	ore Barrel	LOGGED BY: T. Jennings			
HAMMER WEIGHT:	NA	DROP: NA	RESPONSIBLE PR M. Hemingway	OFESSION	AL:	REG. NO.
Sample Sample Sample Sample Sample Foot Foot	Reading (DESCRIPTION USCS): color, moist, % by wt., plast. density, str cementation, react. w/HCl, geo. inter. Surface Elevation: 578.27 (Grnd.) TO	ucture,		WELL CONST	TRUCTION AND/OR
2- - 4- - 6-	GRAY 0.0 GRAY ~30% slight	aterial (gravel) (EY SAND (SC): dark brown, wet, ~85% finum grained sand, ~10% clay, ~5% calcared es, loose to slightly firm VELLY SANDY CLAY (CL): light brown, dark clay, ~50% gravel (<1"), ~20% medium sally, plastic ((CH): grayish brown, damp, stiff, plastic, clay mottled with dark gray clay	e to	1	Vell Vault 2" Steel trafficent concrete " Diameter Scalush-threaded with O-rings	cover set
	Same	e as above, becoming gray		κρόροβούρο βούρο βούρ Αθακόρο βούρο βούρο Αθακόβουρο βούρο βού		
14	^			- Brakari		WELL3
<i>?</i> ?	Geom	atrix Consultants	Project N	lo. 7168	Pag	e 1 of 6

PROJECT: Morton Reading FI Log of Well No. UAW10-80 (cont'd) **SAMPLES** OVM Reading WELL CONSTRUCTION Sample No. Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS CLAY (CH): continued 16 18 0.0 20 8" Borehole 22 0.0 24 Same as above 26 Centralizer 28 0.0

30 WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 6

Log of Well No. UAW10-80 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Sample No. DESCRIPTION Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. DETAILS AND/OR DRILLING REMARKS CLAY (CH): continued 32 34 36 Cement/bentonite grout 38 SANDY CLAY (CL): grayish brown, wet, ~50% fine sand, ~50% clay, slightly plastic, ~50% fine sand, soft CLAY (CH): yellowish brown, damp, very stiff, very plastic GRAVELLY SANDY CLAY (CL): yellowish brown, stiff, ~70% clay, ~20% fine to medium sand, and ~10% fine gravel (0.25"), plastic, moderately stiff SAND (SP): brown, wet to saturated, loose, fine to medium grained, loose 46 WELL3 /X **Geomatrix Consultants** Project No. 7168 Page 3 of 6

PROJECT:

Log of Well No. UAW10-80 (cont'd)

Project No. 7168

Page 4 of 6

	MPLES	_ <u>5</u>	DESCRIPTION		WELL CONSTRUCTION
Sample No.	Sample Blows/ Foot	OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		DETAILS AND/OR DRILLING REMARKS
			GRAVELLY SANDY CLAY (CL): brown, wet, ~85%	444 444	
			clay, 10% fine sand, ~5% fine gravel (<0.25"),	444 444	
				888 888	
		-	moderately plastic	- 444	
			GRAVELLY SAND (SW): brown to dark brown,	224 224	
-			saturated,~90% fine to medium grained, ~10% fine to	-000 000	
)-			very coarse gravel (up to ~4"), loose	444 444	
,-				7444 444	
_				444 444	
				444 444 444 444	
-				444 444	
				444 444	
-				 	
,_				444 444	
2-				444 444	
4				444 444	
				7444	
4					
				444	
7				444	
. –				444 444	
				7444 444	
4				1444 444	
				444 444	
\dashv	-			-000 000	
				444 444	
7				-444 444	
5-				444 444	
'			GRAVELLY SANDY CLAY (CL): greenish gray to	7444 644	
4			dark green, dry to damp, ~70% clay, ~20% very fine	444 444	
			to coarse grained sand, ~10% gravel (<~4" diameter	444 444	
7			locally), nonplastic to slightly plastic, very hard	- 444 444	
			locally), horiplastic to slightly plastic, very hard	444 444	
3-				0 0 0 0 0 0	
				444 444	
-				444 444	
				444 444	
7				444 444 444 444 444 444 444 444 444 44	
				444 444	
1					
				444	
7					
			,	444 444	
1				- 444 444 444 444 444 444	
4				444 444	
			•		
-				1 4 4 4 4 4	
				10404044 10404044 1040444 1040444 1040444	
7					
7				- 44 44 44 44 44 44 44 44 44 44 44 44 44	
4				444	
				- q q q q q q q q q q q q q q q q q q q	
↓					
			SILTY CLAY (CL): dark gray, wet to saturated,	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
+			~70-60% clay ~30-40% silt, slightly plastic	444 444	
1			·	4444	

Geomatrix Consultants

		Log of Well No. UAW10-80 (cont'c		
DEPTH (feet) Sample No Sample No Sample No COVM OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, go	ist. density, structure, eo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS	
66- - - - - - - - - - - - - - - - - - -	SILTY SAND (CL): continued Very large cobbles at 65 - 75' Up to and greater than 6" diameter Same as above		## Diameter stainless steel wraparound screen with 0.020" slots ## Centralizer	
/X	Geomatrix Consultants	Project N	well3 o. 7168 Page 5 of 6	
		1.15,500.10	. 535 5 51 5	

Morton Reading FI

PROJECT:

Morton Reading FI PROJECT: Log of Well No. UAW10-80 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, DETAILS AND/OR cementation, react. w/HCl, geo. inter. DRILLING REMARKS SAND (SP): brown, saturated, very fine to medium grained, well bedded with silt laminae locally, loose to moderately campact 84 0.5' End cap 86 **GRAVELLY SANDY CLAY** Formation material Total Depth: 87 feet below ground surface 88 90 92 94 96 98

WELL3

Geomatrix Consultants

Project No. 7168

Page 6 of 6

PROJECT: Morton R	eading FI	Log of Well No. UAW11-10	
BORING LOCATION: S	5. of Tank Farm	GROUND SURFACE ELEVATION AND DATUM: 553.83 (Grnd.) TOC 553.48 ft. (MSL)	
DRILLING CONTRACTOR:	Bowser Morner	DATE STARTED: DATE FINISHED: 4/17/01	
DRILLING METHOD: F	Rotasoni c	TOTAL DEPTH (ft.): SCREEN INTERVAL (ft.	.):
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	14.5 9 - 14 DEPTH TO WATER ATD: CASING:	
		NA 4" Diameter PVC LOGGED BY:	
SAMPLING METHOD:	10' Sample Barrel	J. Eidem RESPONSIBLE PROFESSIONAL: REG. NO	
2115152	JA DROP: NA	M. Hemingway NA	
Cample Sample Sample Sample Blows/ Sample Coot Coot Coot Sample S	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.	DETAILS AND/OR	
Sa Sa T	Curiace Elevation: 000:00 (Orna.) 1	OC 553.48 ft. (MSL) DRILLING REMARKS	S
	0'-14.5' taken from log of UAW11-40 Concrete	Well Vault 12" Steel traffic vault se	t
-	LEAN CLAY (CL): olive gray (5Y 4/2), moist, ~9	5%	
	medium plasticity fines, ~5% fine sand, firm, no structure	Table label	
2-		A SE A Cemeno Demonite grout	
		150 150	
4-	•	ু কিন্তুৰ কিন্তু	
-			
-		1-8 8	
6-			
-			
-		Bentonite chips	
-			
8-			
-			
-			
		#6 Global filter pack	
10-	POORLY GRADED SAND (SP): olive (5Y 5/2)		
	moist, ~95% fine and medium sand, ~5% fines gravel	with] [] [] []	
		4" Diameter stainless	
12-		steel continuous	
_		wrapped screen with 0.020" slots	
_			
	SANDY LEAN CLAY [TILL]: dark gray (2.5Y 4/moist, ~70% high to medium plastic fines, ~30%		
14			WELL:
/%	Geomatrix Consultants	Project No. 7168 Page 1 of 2	

Log of Well No. UAW11-10 (co) (cont'd)						
DEPTH (feet)	Sample No.	Sample M	Blows/ S Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plase cementation, react. w/HCl, ge	st. density, structure, so. inter.		DI	L CONSTRUCTION ETAILS AND/OR LLING REMARKS
					and medium gravel, hard, no structur	re		0.75" E	End cap
_		Ш							
_					Total Depth: 14.5 feet below ground	surface			
16-	-								
-									
-									
_									
18-	-								
_									
_									
-	-								
20-									
_									
22-									
_									
_									
24-									
_									
_									
-									
26-									
_									
-									
_									
28-	-								
_									
-	-								
30-									
-									- 100,
									WELL3
			_/.	**	Geomatrix Consultants		Project No.	7168	Page 2 of 2

PROJECT: Morton Readir	ng FI	Log of Well I	No. UAW11-40
BORING LOCATION: S. of	Tank Farm	GROUND SURFACE ELEVA 553.73 (Grnd.) TOC 55	
DRILLING CONTRACTOR: [Bowser Morner	DATE STARTED: 4/17/01	DATE FINISHED: 4/17/01
DRILLING METHOD: Rotas	sonic	TOTAL DEPTH (ft.): 45.0	SCREEN INTERVAL (ft.): 34 - 44
DRILLING EQUIPMENT: 8"	Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC
SAMPLING METHOD: 10'	Sample Barrel	LOGGED BY: J. Eidem	1 Diameter 1 VO
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSI M. Hemingway	ONAL: REG. NO.
Creet) Sample No. No. Sample Blows/ Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure cementation, react. w/HCl, geo. inter. Surface Elevation: 553.73 (Grnd.) TO	ucture,	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
2 - 1.9 1.9 1.9 1.4 1.4 1.4	Concrete LEAN CLAY (CL): olive gray (5Y 4/2), moist, ~95 medium plastic fines, ~5% fine sand, firm, no structure More sand than above, ~80% fines, ~20% sand POORLY GRADED SAND (SP): olive (5Y 5/2), comoist, ~95% fine and medium sand, ~5% fines for gravel, black (N 2/5) at 6.5' bgs 6.5' - 14.5': black discoloration		Well Vault Steel traffic cover set in concrete 4" Diameter PVC riser Cement/bentonite grout 8" borehole Centralizer
14	SANDY LEAN CLAY (CL) [TILL]: dark gray (2.5)	र विक्य	WELL3
/XS	Geomatrix Consultants	Project No. 7168	Page 1 of 3

Log of Well No. UAW11-40 (cont'd)

Sample No.	ws/	Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR
San San San	Blows/ Foot	Re C	cementation, react. w/HCl, geo. inter.		DRILLING REMARKS
			4/1), moist, 70% high to medium plastic fines, 30%	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
-			sand and medium gravel, hard, no structure	444	
				444 444	
		4.4		444 444	
-				444 444	
3-				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
77				444 444	
4 11				444 444	
				444 444	
7 11				444 444	
-		_		444 444	
.		9.8		0 0 0 0 0	
3-					
4 11		İ		1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
				444	
1				444	
				444	
				1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
)-		6.7		1 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	— 4" Diameter PVC riser
]		o.,		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
				4444	
-				444	
				144 444	
7 11				444 444	
<u>!</u>			Deduced the second trans	444 444	
			Dark greenish gray (5GY 4/1)	444	
7 11				444	
4 11				444	
				444	
7 11				444	
ļ-				4444	
				4 4 4 4	
7				444	
_				444 444	Cement/bentonite grout
		0.0		- 444 444 444 444	Semenubenionile grout
				444	
;_				444 444	
				444	
				444	
				444 444	9" Diameter harrists
					8" Diameter borehole
-				444	
				444	
				444	
4				444	
				140	
7	7			444 444	
4 11				444	
				9 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
)-			CLAY (CL): dark grayish brown (10YR 4/2), moist to		
			wet firm 100% high plactic fines trace fine and		— Pontonito china
			wet, firm, 100% high plastic fines, trace fine sand,		— Bentonite chips

Geomatrix Consultants

Project No. 7168

Page 2 of 3

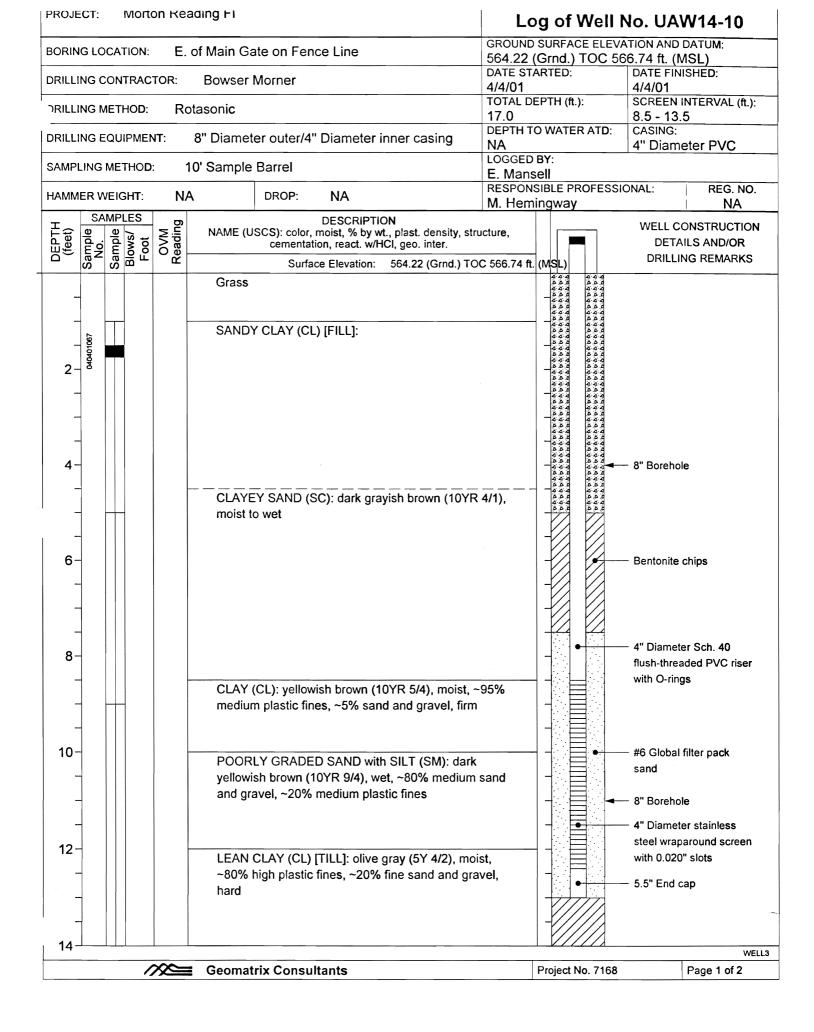
PROJECT: Morton Reading FI Log of			Log of Well No. UA	Well No. UAW11-40 (cont'd)	
Sample No.	Blows/ Sample Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast cementation, react. w/HCl, geo	. density, structure, . inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS	
32 34 36	0.0	homogeneous 33.5'-34' olive (5Y 5/6), trace gravel POORLY GRADED SAND (SP): light	olive brown	← 8" Borehole	
38-		(2.5Y 5/4), moist to wet, 95% coarse s 38'-43' fine sand		—— 4" Diameter stainless steel continuous wrap screen with 0.020" slots	
42-	_	Cobble, coarse sand at contact SILT (MC): yellowish brown (10YR 5/4 100% low plastic fines, few iron colore		#6 Global filter pack sand0.75" End capFormation material	
46-	0.0	Total Depth: 45 feet below ground sur	face		
48				WEI	

PROJECT: Morton Re	eading FI	Log of Well	No. UAW12-20	
BORING LOCATION:	I. of Slurry Wall Near Gate		GROUND SURFACE ELEVATION AND DATUM: 555.49 (Grnd.) TOC 555.19 ft. (MSL)	
DRILLING CONTRACTOR:	Bowser Morner	DATE STARTED: 3/24/01	DATE FINISHED: 3/24/01	
`RILLING METHOD: R	Rotasonic	TOTAL DEPTH (ft.): 18.0	SCREEN INTERVAL (ft.): 8 - 18	
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD:	CASING:	
SAMPLING METHOD:	10' Sample Barrel	NA LOGGED BY:	4" Diameter PVC	
	IA DROP: NA	J. Eidem RESPONSIBLE PROFESS	ONAL: REG. NO.	
		M. Hemingway	NA NA	
DEPTH (feet) Sample No. Sample Blows/ Foot OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, s cementation, react. w/HCl, geo. inter.	tructure,	WELL CONSTRUCTION DETAILS AND/OR	
Sar Sar Sar Fc	Canade Elevation: Coo. to (Oma.) 1	OC 555.19 ft. (MSL)	DRILLING REMARKS	
	Asphalt Sand and road base material		Well Vault 12" Steel traffic cover set in concrete Cement/bentonite grout	
4-	CLAY (CL): black, moist, firm, 100% medium pi fines, firm, trace gravel, chemical odor, black st at 4 - 15'	1 18.6.4 18.6.4	- 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings - Bentonite Chips - Centralizer	
8- 10- 12- 12- 12- 1-	POORLY GRADED SAND (SP): black, moist, medium sand, ~10% 1/2" - 1" gravel, chemical	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	#6 Global filter pack sand	
14			steel wraparound 0.020" slots	
/XS	■ Geomatrix Consultants	Project No. 7168	Page 1 of 2	

PROJE	ECT:		Mort	on Read	ding FI	Log of We	II No. UAW	12-20 (cont'd)
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					POORLY GRADED SAND (SP): co	ntinue d		
16-					LEAN CLAY (CL) [TILL]: some blac 15', becomes dark greenish gray (5 dry, ~80% high to medium plastic fir and gravel, moist to dry, very hard, 17'	GY 4/1), moist to nes, ~20% sand		- 8" Borehole
_	-							5 25 Feed
18-		$oxed{\perp}$	-		Total Depth: 18 feet below ground s	urface		- 5.25" End cap
-	-				. S.a. Bapan To Tool bolow ground a			
_								
20-								
_					,			
_								
22-								
_								
_								
-	-						_	
24-							_	
-								
-								
26-								
-								
-								
28-								
-								
-	1							
-								
30-								-
								WELL3
			/	% =	Geomatrix Consultants	·	Project No. 7168	Page 2 of 2

ROJECT: Morton R	eading FI		I No. UAW13-20
ORING LOCATION:	S. of Slurry Wall Near N. Gate	GROUND SURFACE ELE 555.86 (Grnd.) TOC	555.54 ft. (MSL)
RILLING CONTRACTOR:	Bowser Morner	DATE STARTED: 3/24/01	DATE FINISHED: 3/24/01
RILLING METHOD:	Rotasoni c	TOTAL DEPTH (ft.): 18.0	SCREEN INTERVAL (ft.): 8 - 18
RILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD	
AMPLING METHOD:	10' Sample Barrel	LOGGED BY: E. Mansell	
IAMMER WEIGHT:	NA DROP: NA	RESPONSIBLE PROFES M. Hemingway	SSIONAL: REG. NO.
(feet) Sample No. Sample Sample Sample Cov OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR
Sample No. Sample Blows/ Foot OVM	Surface Elevation: 555.86 (Grnd.)) TOC 555.54 ft. (MSL)	DRILLING REMARKS
	0'-18' taken from log of UAW12-20	4	— Well Vault
-	Asphalt	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	12" Steel traffic cover set
	Sand and road base material	444	in concrete
050	CLAY (CL): black, moist, firm, 100% medium fines, firm, trace gravel, chemical odor, black	1 10.0.0 10.0.0	Cement/bentonite grout
032401050	at 4 - 15'	Stalling and and	Cemenobenionite grout
2- 8	dt 4 - 10	_444 444 444 444	
-		_ a a a a a a a a a a a a a a a a a a a	
_		444 444 444 444	— 4" Diameter Sch. 40
		9 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	PVC riser with O-rings
-			, To need wan e mige
4-	•	_ 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
		444 444 444 444	
7			
	Black staining at 5 - 15.5'		
	Strong chemical odor		Bentonite chips
	Chang anemical addi		· · · · · · · · · · · · · · · · · ·
6-			
-			
			•
			Centralizer
-			
8-			
	POORLY GRADED SAND (SP): black, mois	t ~90%	#6 Global filter pack
-	medium sand, ~10% 1/2"-1" gravel, few clay		sand
10-	chemical odor		
ון דטו			
-			
			4" Diameter stainless
25	Saturated		steel wraparound screen
032401051		17 = 1	with 0.020" slots
12- g			
_			
14			
			WE
<i>19</i> 90	Geomatrix Consultants	Project No. 716	Page 1 of 2

PROJE	ECT:		Mort	on Re	ading FI			
						Log of We	II No. UAW13-20	(cont'd)
DEPTH (feet)	SA	ple Dle	LES	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pl	ast density structure		CONSTRUCTION FAILS AND/OR
	Sample No.	Sam	Blows/ Foot	Res	cementation, react. w/HCl, o	geo. inter.	DRILI	ING REMARKS
					POORLY GRADED SAND (SP): co	ontinued		
_							8" Boreh	ole
10					LEAN CLAY (CL) [TILL]: some blace			
16-			COOL	-	15' becomes dark greenish gray (5 dry, ~80% high to medium plastic fi			
					and gravel, very hard	•		
18-							5.25" En	d cap
10					Total Depth: 18 feet below ground	surface		•
_								
20-								
_								
_	-							
_								
22-								
-	-						_	
_								
-								
24-								
_							-	
_								
26-								
_								
28-								
20-								
_								•
30-								
-								
								WELL3
			1	% =	Geomatrix Consultants		Project No. 7168	Page 2 of 2



Log of Well No. UAW14-10 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR DRILLING REMARKS** LEAN CLAY (CL) [TILL]: continued more gravel (1'-2") than above 16 4" Borehole becomes very hard and dry 16'-17' cobble Total Depth: 17 feet below ground surface 18 20 22 26 28 30 WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

PROJECT:

Morton Reading FI

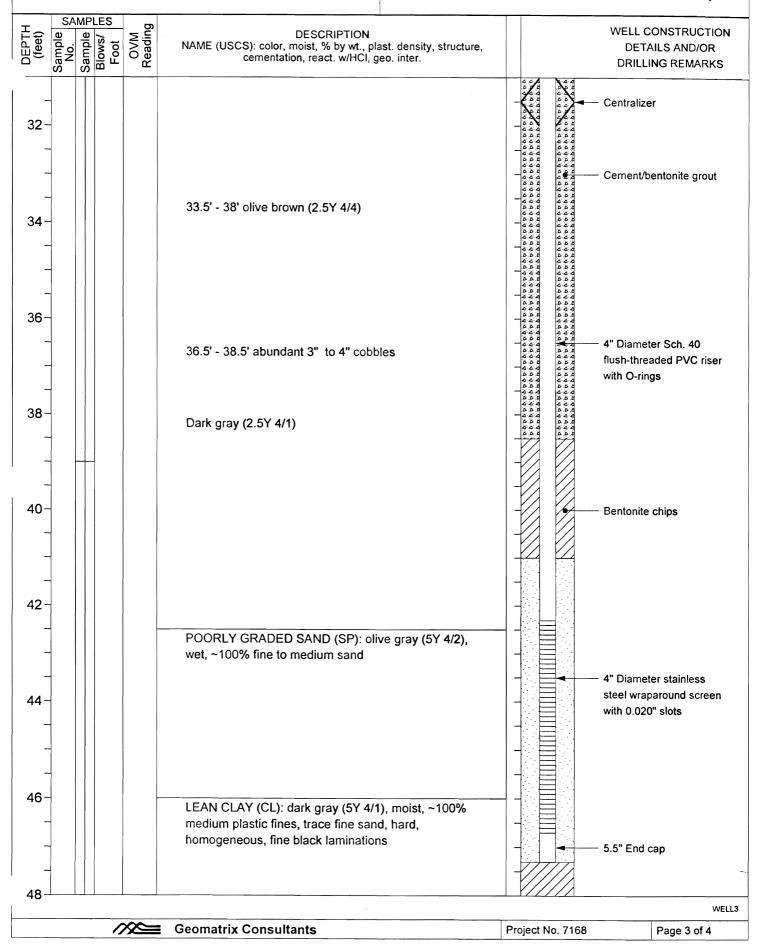
	eding FI		No. UAW15-20			
ORING LOCATION: N.	of Bldg. 18 (10'-12' S. of UAW15-50)	1	GROUND SURFACE ELEVATION AND DATUM: 561.65 (Grnd.) TOC 561.34 ft. (MSL)			
DRILLING CONTRACTOR:	Bowser Morner	DATE STARTED: 4/9/01	DATE FINISHED: 4/9/01			
ORILLING METHOD: Ro	otasoni c	TOTAL DEPTH (ft.): 19.0	SCREEN INTERVAL (ft.): 9 - 19			
DRILLING EQUIPMENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC			
SAMPLING METHOD: 1	0' Sample Barrel	LOGGED BY: E. Mansell				
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSI M. Hemingway	ONAL: REG. NO. NA			
Sample Sample Sample Sample No. Sample Blows/ Sample Coot Sample	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter.	y, structur e ,	WELL CONSTRUCTION DETAILS AND/OR			
Sal Sal	Surface Elevation: 561.65 (Grnd.	.) TOC 561.34 ft. (MSL)	DRILLING REMARKS			
01080 (duplicate)	0'-19' taken from log of UAW15-50 Asphalt, base material	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Well Vault — 12" Steel traffic cover set in concrete — Cement/bentonite grout			
2	SANDY CLAY (SC) [FILL]: very dark gray (5 moist, firm	Y 3/1),	 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings 			
040901081			Bentonite chipsCentralizer			
10-	POORLY GRADED SAND (SP): dark yellow brown (10YR 4/4), moist, ~100% fine to med	1 1:1: . 1	— 8" Borehol e			
14			WELL3			

PROJE	ECT:		Morte	on Rea	eding FI					
						Log of We	ell No	o. UAV	V15-20	(cont'd)
I	SA	MPL	.ES	<u>p</u>	DECORIDATION			······	WELLO	CONSTRUCTION
DEPTH (feet)	Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, leo. inter.			DET	AILS AND/OR ING REMARKS
					POORLY GRADED SAND (SP): co	ntinued				,
							17:::		411 50:	
										ter stainles s paround scre en
16								目	with 0.02	
16-							17	目		
							17	目丨		
					CLAY (CL): dark grayish brown (10)		77	目	— #6 Globa sa nd	l filter pack
18-					~100% high plastic fines, homogen	eous				
10							17	目丨		
_									5.5" End	cap
_					Total Depth: 19 feet below ground s	surface				
20-										
-					•					
_	-									
22-	4									
-							14			
-										
-										
24-	-						14			
-	-									
-	-									
-	-									
26-	-						-			
-	-						-			
-	-						-			
-	1						-			
28-	-						-			
-	+						-			
-	+						-			
-	1						1-			
30-	1						-			
-	-						-			
-										WELL3
			1	**	Geomatrix Consultants		Projec	t No. 7168		Page 2 of 2

ркојест: молоп кеаа	ling ⊢i	Log of Well N	No. UAW15-50	
BORING LOCATION: N. of	f Bldg. 18	GROUND SURFACE ELEVA		
DRILLING CONTRACTOR:	Bowser Morner	516.31 (Grnd.) TOC 56 DATE STARTED:	DATE FINISHED:	
DRILLING CONTRACTOR.	bowser Morrier	4/8/01	4/8/01	
DRILLING METHOD: Rota	asonic	TOTAL DEPTH (ft.): SCREEN INTERVAL (ft.) 59.0 42.3 - 47.3		
DRILLING EQUIPMENT: 8	" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD:	CASING:	
		NA LOGGED BY:	4" Diameter PVC	
SAMPLING METHOD: 10	' Sample Barrel	E. Mansell		
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSION M. Hemingway	ONAL: REG. NO.	
Sample No. Sample Blows/ Sample Foot COVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, strucementation, react. w/HCl, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR	
DEPTH (feet) Sample No. Sample Blows/ Foot OVM Readin	Surface Elevation: 516.31 (Grnd.) TO	C 560 96 ft (MSL)	DRILLING REMARKS	
. 03 03 —	Asphalt, base material	3 300:30 K. (MOL)	Well Vault	
	, sopriori, sass material		- 12" Steel traffic cover set	
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	in concrete	
	SANDY CLAY (SC) [FILL]: very dark gray (5Y 3/1),		
	moist, firm			
2-				
-				
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
4- /\				
\ \-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				
6-	Dark yellowish brown (10YR 4/4), hard	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
		4444		
		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
		- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
	POORLY GRADED SAND (SP): dark yellowish			
8- -8	brown (10YR 4/4), moist, ~100% fine to medium	sand - 444 644	- Cement/bentonite grout	
0.0	· · · · · · · · · · · · · · · · · · ·			
		444 444 444 444		
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
10-				
	All Oakklas			
	4" Cobbles Coarser than above	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
	Course than above			
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
12-				
		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
			. was	
14		HARAI HARAI I	WELL3	
/X	Geomatrix Consultants	Project No. 7168	Page 1 of 4	

PROJECT: Morton Reading FI Log of Well No. UAW15-50 (cont'd) SAMPLES OVM Reading DEPTH (feet) WELL CONSTRUCTION Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, **DETAILS AND/OR** cementation, react. w/HCl, geo. inter. DRILLING REMARKS POORLY GRADED SAND (SP): continued CLAY (CL): dark grayish brown (10YR 4/2), ~100% high plastic fines, moist, homogeneous 16 0.0 Dark gray (10YR 4/1) 18 0.0 Same as above 20 22 24 0.0 Cement/bentonite grout Yellowish brown (10YR 5/4) 26 0.0 27' - 27.5' sand lens 28 POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), moist to wet, ~100% medium sand, trace fines 0.0 LEAN SANDY CLAY (CL) [TILL]: dark gray (2.5Y 30 4/1), ~80% medium plastic fines, ~10% sand gravel, hard WELL3 /XS **Geomatrix Consultants** Project No. 7168 Page 2 of 4

Log of Well No. UAW15-50 (cont'd)



PROJ	ECT:		Mort	on Re	ading FI	15 \\		ALAE FO (
						Log of We	II NO. UA	W15-50 (cont'd)
DEPTH (feet)	Sample No.	Sample 3	Blows/ ST Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pl cementation, react. w/HCl, g	ast. density, structure, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
-					48' - 48.5' : sand lens white crystal material		-///	■ 8" Borehole
50-					SANDY LEAN CLAY (CL) [TILL]: day (5GY 4/1), ~85% medium to high plus and/gravel, very hard <1" sand lens at 50.5'			— Bentonite
52 - -	-							4" Borehole
54-								
56-							-	
58-	- - - -				Total Depth: 59 feet below ground s	surface		— Formation material
60-								
62-								
64-							_	
				. 00			r	WELL3
				~	Geomatrix Consultants		Project No. 716	8 Page 4 of 4

PROJE	CT:	l	Morto	n Rea	ading FI	L	og of Well No. UAV	V16-10	
BORING	S LO	CAT	ΓΙΟΝ:	~6	0 ft. W. of Bldg. 21		D SURFACE ELEVATION AND E (Grnd.) TOC 554.71 ft. (M		
DRILLIN	1G U	:ON	TRAC	TOR:	Boart Longyear	DATE S	TARTED: DATE FINIS		
							8/22/01 8/22/01 TOTAL DEPTH (ft.): SCREEN INTERVAL (ft.		
ORILLIN	IG N	1ETH	HOD:	Ro 	tasonic	15.5	5 - 15		
ORILLIN	IG E	QUI	IPMEN	NT:	Gussbach Sonic	5.7'	TO WATER ATD: CASING: 4" Diame	eter PVC	
SAMPL	ING	ME	THOD	1	0' Core Barrel	LOGGE	DBY:	7.01 1 70	
_						T. Jenr	nings NSIBLE PROFESSIONAL:	REG. NO.	
HAMME				NA		M. Her	ningwa y	NA	
DEPTH (feet)	Sample No.	Sample 🚡		OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density cementation, react. w/HCl, geo. inter.	, structure,		ONSTRUCTION ILS AND/OR	
<u> </u>	Saz	Sar	용관	Re	Surface Elevation: 555.00 (Grnd.)) TOC 554.71 f	t. (MSL) DRILLIN	IG REMARKS	
					Concrete		Well Vault		
					Caliche fill		in concrete	affic cover set	
7					CLAYEY GRAVELLY SAND (SC): dark brow		Cement/be	ntonite grout	
	_	\sqcup			clay plastic, ~10% fine gravel (<1/2"), ~60% fine dium sand, moist	fine to			
2-	082201178				modum dana, molet		Bentonite o	chips	
_	082			0.0					
-									
_					SANDY CLAY (CH): light brown to brown, we very plastic	et, soft,			
4-				0.0	very plastic		4" Diamete	r Sch. 40	
4				0.0			그 국가의 기사의	ded PVC riser	
4							with O-rings	S	
	4			0.5	CLAYEY SAND (SW/SC): tan to dark brown, ~10% gray clay interbeds and rip up clasts, ~				
6-	082201177				fine to coarse sand, loose, moderate hydroca		11 = 1		
	0				\door \\ GRAVELLY SAND (SW): black, saturated, ~	100/ fine			
					gravel (<1/2"), clay as above down to 6.2', ~				
				1.7	to coarse grained sand, loose, heavy hydroca	arbon	16-30 sand	і раск	
_					odor, possible free hydrocarbon, intense blac staining	ck			
8-					Statility		→ 8" Borehole	е	
-				2.4					
-									
-									
10-							Centralizer		
4									
				52.6			4" Diamete	er stainlese	
10								around screen	
12-					SANDY GRAVELLY CLAY (CL): dark gray, of	damp,	with 0.020"	' slot s	
٦					~20% fine to coarse sand, ~20% gravel (<2"), ~60%			
-				38.5	gray clay, very stiff, moderately plastic, hydro staining locally along small fractures	ocarbo n			
-					stanting locally along small flactures				
14								WEL	
		_	1	%	Geomatrix Consultants		Project No. 7168	Page 1 of 2	

PROJI	ECT:		Mort	on Re	ading FI	l og of Ma		\
						LOG OI WE	ell No. UAW16-10	(conta)
DEPTH (feet)	Sample S No.	Sample &	Blows/ T Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pl cementation, react. w/HCl, g	ast. density, structure, eo. inter.	DE	CONSTRUCTION TAILS AND/OR LING REMARKS
-					SANDY GRAVELLY CLAY (CL): co	ntinued	6" End	сар
16-	-				Total Depth: 15.5 feet below ground	I surface		
18-							- - -	
20-	-						- - -	
22-							- - -	
24-							- - -	
26-							- - -	
28-							- - -	
30-								
-								
-		<u> </u>						WELL3
			1.	% =	Geomatrix Consultants		Project No. 7168	Page 2 of 2

PROJECT: Moi	rton Rea	ding FI	Log of Well	No. UAW17-40	
BORING LOCATION	 I: S. 0	of Bldg. 26	GROUND SURFACE ELEV		
DDILLING CONTRA			574.68 (Grnd.) 577.11 DATE STARTED:	DATE FINISHED:	
DRILLING CONTRA		Bowser Morner	4/5/01 4/5/01		
ORILLING METHOD	: Rot	tasonic	TOTAL DEPTH (ft.): 49.0	SCREEN INTERVAL (ft.): 24.5 - 39.5	
DRILLING EQUIPME	ENT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC	
SAMPLING METHO	D: 1(0' Sample Barrel	LOGGED BY: E. Mansell		
HAMMER WEIGHT:	NA	DROP: NA	RESPONSIBLE PROFESS M. Hemingway	IONAL: REG. NO.	
(feet) ample No. ample Salows/ Salows/	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR	
(feet) Sample No. Sample Blows/	[0 8 -		77.11 TOC, ft. (M\$L)	DRILLING REMARKS	
2-	0.0	Grass, [FILL] SANDY CLAY (CL) [FILL]: dark yellowish brown (10YR 4/4), moist, ~80% medium plastic fines, sand, gravel, firm	1 44		
4 1 1 6	4.2	4.5' - 5' : black material, odor, metallic object [sl metal, wire, glass?]	Heet	 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings 	
8-	0.0		विष्यकृतिकृत्यं कृतवृत्वकृत्यं कृतवृत्वकृत्यं कृतवृत्वकृत्यं कृतवृत्वकृत्यं कृतवृत्वकृत्यं कृतवृत्वकृत्यं कृतव विष्यात् वृत्वकृत्यं कृतवृत्वकृत्यं कृतव्यकृत्यं कृत्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृत्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृत्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृतव्यकृत्यं कृत्यं कृतव्यकृत्यं कृतव्यवयव्यकृत्यं कृतव्यवयव्यवयव्यवयव्यवयव्यवयव्यवयव्यवयवयव्यवयवयवयव्यवयवयवयवयव्यव	— Cement/bentonite grout	
10-	0.3	9.5' : 4" Cobble LEAN CLAY (CL) [TILL]: light olive brown (2.5Y moist, ~85% medium plastic fines, ~15% sand/g firm to hard	א א א א א א א א א א א א א א א א א א א		
12-	0.1	Dark greenish gray (10Y 4/1)	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
14			الأمم الممم		

PROJECT: M	lorton Read	aing FI	Log of Well No	o. UAW17-4	0 (cont'd)
DEPTH (feet) Sample No. Sample Blows/		DESCRIPTION NAME (USCS): color, moist, % by wt., plast. de cementation, react. w/HCl, geo. int	nsity, structure, er.	D	L CONSTRUCTION ETAILS AND/OR ILLING REMARKS
16-	0.1	LEAN CLAY (CL) [TILL]: continued Increasing sand content			
20-	0.0	2" to 3" cobbles POORLY GRADED SAND (SP): dark grawet, 100% fine sand	y (5Y 4/1),	Bento	nite chips
24- - - - 26-		1"-2" gravel, wood 1"x 3" POORLY GRADED SAND (SP): olive grawet, 100% medium to coarse sand	iy (5Y 4/2),	Centra	ilizer
28-	0.0			sand	obal filter pack
30-		Same as above		steel v	meter stainless vraparound screen 020" slots
					WEL

PROJECT: Morton Reading FI Log of Well No. UAW17-40 (cont'd) SAMPLES DEPTH (feet)
Sample
No.
Sample
Blows/
Foot OVM Reading WELL CONSTRUCTION DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. DETAILS AND/OR DRILLING REMARKS POORLY GRADED SAND (SP): continued 32 34 36 8" Borehole 38 0.0 CLAY (CL): dark gray (2.5Y 4/1), moist, 100% high plastic fines, homogeneous, soft 5.5" End cap 40 Bentonite chips 42 4 " Borehole 0.0 46 48 WELL3

Project No. 7168

Page 3 of 4

Geomatrix Consultants

PROJ	ECT:	ı	Mort	on Rea	ading FI	Log of Wel	l No	o. UAW17-40 (cont'd)	
DEPTH (feet)	Sample No.	Sample N	Blows/ ST Soot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	ist. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS	
					CLAY (CL): continued			4" Borehole	
50-					Total Depth: 49 feet below ground s	urface	_		
-							_		
52-									
							-		
54									
56-							-		
58	_						-		
60-							_		
	-								
62	-								
64									
				% =	Geomatrix Consultants		Projec	well with No. 7168 Page 4 of 4	_3

PROJECT	г: І	Morto	n Rea	ading FI	Log of Well	No. UAW18-20
BORING L	LOCAT	TION:	Ne	ar S.W. Corner Bldg. 22	GROUND SURFACE ELEV 556.50 (Grnd.) TOC 5	
DRILLING	S CON	TRACT	OR:	Boart Longyear	DATE STARTED:	DATE FINISHED:
					8/23/01 TOTAL DEPTH (ft.):	8/23/01 SCREEN INTERVAL (ft.):
RILLING	METI	HOD: 		tasoni c	25.0	7.5 - 17.5
DRILLING	S EQUI	IPMEN	T:	Gussbach Sonic	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC
CANADIAN		TUOD		WIV 401 Care David	LOGGED BY:	4 Diameter PVC
SAMPLIN	IG ME	IHOD:		" X 10' Core Barrel	T. Jennings	101111
HAMMER	WEIG	SHT:	NA	DROP: NA	RESPONSIBLE PROFESS M. Hemingway	IONAL: REG. NO.
	SAMPL		_ p	DESCRIPTION DESCRIPTION		WELL CONSTRUCTION
DEPTH (feet)	No. Sample	3lows/ Foot	OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, strucementation, react. w/HCl, geo. inter.	icture,	DETAILS AND/OR
Sar	No. Sample	용도	_ &	Surface Elevation: 556.50 (Grnd.) TO	C 556.17 ft. (MSL)	DRILLING REMARKS
				Concrete	4 4	Well Vault
			0.5	Base/fill material	2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	— 12" Steel traffic cover set
178				SANDY GRAVELLY CLAY (CL): brown, wet, ~60		in concrete
1 1		[20.4	clay,~30% fine to coarse sand, ~10% fine gravel soft, moderately plastic	,	— Cement/bentonite grout
				Soft, moderatory plastic	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	gradi
2-						
			0.0			
			0.0			
1						— Bentonite chips
4-						— bentonite crips
' -						
_						
6-				CDAVICLLY CAND (CIAD, become to great that 7	00/	
			0.0	GRAVELLY SAND (SW): brown to gray, wet, ~70 sand, ~30% gravel (<2"), loose, uncemented	0%	
				cana, con gravar (2), reces, ancomented		
						8" Borehole
-						
8-						
			4.7	SAND (SW): brown, wet to saturated, fine to coagrained, loose	rse	— 16-30 Silica sand
				granica, 10000		.5 55 555 56116
10-			0.2	Same as above but black with moderate hydroca	arbon	
			J.2	odor		
			0.0			
12-						
						- 44
1						
14		enant.				WELL3
		1	% =	Geomatrix Consultants	Project No. 7168	Page 1 of 2

PROJECT: Morton Reading FI Log of Well No. UAW18-20 (cont'd) SAMPLES OVM Reading DEPTH (feet) WELL CONSTRUCTION Sample No. Sample Blows/ Foot **DESCRIPTION** NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS CLAY (CH): gray, damp, very stiff, very plastic 1.7 SAND (SW): dark brown to black, wet, loose 16 1.4 18 SANDY GRAVELLY CLAY (CL): gray, damp, ~60% clay, ~20% fine to coarse sand, ~20% gravel (<2"), moderately stiff 20 GRAVELLY CLAY (CL): gray to greenish gray, damp, 0.1 very stiff, moderately plastic, with small green clay Bentonite chips clasts and ~5% small (<1/4") gravel 22 Total Depth: 25 feet below ground surface 26 28 30 WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 2

DRILLING CONTRACTOR: Bowser Morner	PROJECT: Morto	on Rea	nding FI	L	og of Well	No. UAW19-80
DATE STARTED: ADATE PINISHED PARTIES AND PRILLING METHOD: Rotasonic PRILLING METHOD: Rotasonic PRILLING METHOD: Rotasonic PRILLING METHOD: Rotasonic PRILLING METHOD: ROTAL DEPTH (II): SCREEN INTERVAL (II): 70,0 most, 35,5 -78,5 most, 36,5 mos	BORING LOCATION:	N.	of E. Tank Farm			
PRILLING METHOD: Rotasonic TOTAL DEPTH (II.): 79.0 G3.5 - 78.5 G2. G8.5 G8.5 G8.5 G8.5 G8.5 G8.5 G8.5 G8.	DRILLING CONTRAC	TOR:	Bowser Morner	DATE S	TARTED:	DATE FINISHED:
DEPTH TO WATER ATD. ACASING: 4" Diameter outer/4" Diameter inner casing NAMPLING METHOD: 10" Sample Barrel DESCRIPTION LIGGED BY: L	ORILLING METHOD:	Ro	tasoni c	TOTAL I	DEPTH (ft.):	SCREEN INTERVAL (ft.):
SAMPLING METHOD: 10' Sample Barrel LOGGED BY: E. Mansell HAMMER WEIGHT: NA DROP. NA RESPONSIBLE PROFESSIONAL: NAME (USCS): color, moist, 46 by vm., plast, density, structure, cemertation, react, wh/fcl, geo. inter. Surface Elevation: Surface Elevation: S78.13 (Grad) TOC 580.09 ft, (MSD) CLAYEY SAND (SC) [FILL]: dark yellowish brown, (10'RR 4/4), moist, 80% medium plastic fines, 20% sand, soft 0.0 SANDY CLAY (CL) [FILL]: dark yellowish brown (10'RR 5.4), moist, 80% medium plastic fines, 20% sand and gravel, soft-firm 10- 0.0 Dark gray (5Y 4/1), hard DESCRIPTION RESPONSIBLE PROFESSIONAL: RESPONSIBLE	DRILLING EQUIPMEN	NT:	8" Diameter outer/4" Diameter inner casing	DEPTH	TO WATER ATD:	CASING:
HAMMER WEIGHT: NA DROP: NA RESPONSIBLE PROFESSIONAL: REG. NO. MA. Herningway SAMPLES SAMPLES SAMPLES SUBJECT OF STRUCTION Surface Elevation: 578.13 (Grad) TOC 580.09 ft. (MSL) Crass CLAYEY SAND (SC) [FILL]: dark yellowish brown (10YR 5.4), moist, 80% medium plastic fines, 20% sand, soft CLAYEY SAND (CLAY (CL)) [FILL]: dark yellowish brown (10YR 5.4), moist, 80% medium plastic fines, 20% sand and gravel, soft-firm Cement/bentonite grout LEAN SANDY CLAY (CL) [FILL]: dark yellowish brown (10YR 5.4), moist, 80% medium plastic fines, 20% sand and gravel, soft-firm DETAILS AND/OR	SAMPLING METHOD	: 1	0' Sample Barrel	LOGGE		4 Diameter PVC
SAMPLES Solid Sol	HAMMER WEIGHT:			RESPO	NSIBLE PROFESS	
Grass CLAYEY SAND (SC) [FILL]: dark yellowish brown (10YR 4/4), moist, 80% medium sand, 20% medium plastic fines, soft 0.0 SANDY CLAY (CL) [FILL]: dark yellowish brown (10YR 5.4), moist, 80% medium plastic fines, 20% sand, soft 0.0 LEAN SANDY CLAY (CL) [TILL]: yellowish brown (10YR 5.4), moist, 80% medium high plastic fines, 20% sand and gravel, soft-firm 0.0 Less sand than above 10 Dark gray (5Y 4/1), hard	I	ading	NAME (USCS): color, moist, % by wt., plast. density,		ningway	WELL CONSTRUCTION
CLAYEY SAND (SC) [FILL]: dark yellowish brown, (10YR 4/4), moist, 80% medium sand, 20% medium plastic fines, soft 0.0 SANDY CLAY (CL) [FILL]: dark yellowish brown (10YR 5.4), moist, 80% medium plastic fines, 20% sand, soft 0.0 LEAN SANDY CLAY (CL) [TILL]: yellowish brown (10YR 5.4), moist, 80% medium high plastic fines, 20% sand and gravel, soft-firm 0.0 Less sand than above 10 Dark gray (5Y 4/1), hard	San San Blor Fo	S S		TOC 580.09 f	ft. (MSL)	DRILLING REMARKS
10- 10- 10- 10- 10- 10- 10- 10-	2 - 040801072		CLAYEY SAND (SC) [FILL]: dark yellowish br (10YR 4/4), moist, 80% medium sand, 20% m		\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4\$4	
10- 0.0 Becomes harder with depth Dark gray (5Y 4/1), hard (10YR 5.4), moist, 80% medium high plastic fines, 20% sand and gravel, soft-firm 0.0 Becomes harder with depth Dark gray (5Y 4/1), hard	4-	0.0	(10YR 5.4), moist, 80% medium plastic fines,			— Cement/bentonite grout
10- 0.0 Becomes harder with depth 12- 0.0 Dark gray (5Y 4/1), hard	6-	0.0	(10YR 5.4), moist, 80% medium high plastic f			
Dark gray (5Y 4/1), hard	8-	0.0	Less sand than above			
0.0 Dark gray (5Y 4/1), hard	10-	0.0	Becomes harder with depth			
WELL:	-	0.0	Dark gray (5Y 4/1), hard			
		~~	Geomatrix Consultante		Project No. 7150	WELL3

PROJECT: Morton Reading FI Log of Well No. UAW19-80 (cont'd) SAMPLES OVM Reading DEPTH (feet) WELL CONSTRUCTION Sample No. Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCI, geo. inter. **DETAILS AND/OR** DRILLING REMARKS LEAN CLAY (CL) [TILL]: continued 040601073 0.0 16 0.0 18 Same as above 20 Cement/bentonite grout 0.0 22 24 0.0 26 SILT with SAND and GRAVEL (SM): dark gray (5Y 4/1), wet, 70% low plastic fines, 30% sand and gravel 8" Borehole 0.0 28 LEAN CLAY (CL) [TILL]: dark gray (5Y 4/1) moist, 90% high plastic fines, 10% sand/gravel, firm to hard 30 CLAY (CL): gray (5Y 5/1), moist, 100% high plastic fines, homogeneous, soft WELL3 **Geomatrix Consultants** Project No. 7168 Page 2 of 5

NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. CLAY (CL): continued CLAY (CL): continued 32- 34- 36- 0.0	PROJECT:	Morto	n Rea	ding FI	Log of We	ell No. UAV	V19-80 (cont'd)
32 - Cement/bentoni 34 - Same as above 40	Ceet) (feet) Sample Solve.	Sample Blows/ Blows/ Broot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	st. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	32- 32- 34- 34- 36- 38- 40- 42- 44-	Sam Blow FOC	0.0	CLAY (CL): continued Same as above	st. density, studiore, eo. inter.		DRILLING REMARKS
	48		∞ =	Geomatrix Consultants			WELL3

Log of Well No. UAW19-80 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION DESCRIPTION Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, DETAILS AND/OR cementation, react. w/HCI, geo. inter. DRILLING REMARKS CLAY (CL): continued 50 Cement/bentonite grout 52 POORLY GRADED SAND (SP): dark vellowish brown (10YR 4/4), wet, 95% medium sand, 5% low plastic fines 54 0.0 56 SILT (ML): 56.5' LEAN CLAY (CL) [TILL]: dark gray (5Y 4/1), dry to moist, 85% low plastic fines, 15% sand gravel, very hard 4" Diameter Sch. 40 flush-threaded PVC riser 58 with O-rings Same as above 60 Bentonite chips POORLY GRADED SAND (SP): light olive brown (2.5Y 5/4), wet, 95% medium to coarse sand, 5% 0.0 gravel (1"0), trace fines 62 SILT (ML): light olive brown (2.5Y 5/4), wet, 100% low plastic fines, trace fine sand, soft Centralizer 64 POORLY GRADED SAND (SP): light olive brown 2.5Y 5/4), wet, 95% medium to coarse sand, 5% WELL3 **Geomatrix Consultants** Project No. 7168 Page 4 of 5

PROJECT:

Morton Reading FI

PROJECT: Morton Reading FI Log of Well No. UAW19-80 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample No. Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, DETAILS AND/OR cementation, react. w/HCI, geo. inter. DRILLING REMARKS gravel, trace fines 65.5-66' silt lens 66 SILTY SAND (SM): light olive brown (2.5Y 5/4), wet, 80% medium sand, 20% low plast fines 0.0

Same as above

gravel

0.0

abundant 3"-4" cobbles (70'-71.5')

WELL GRADED SAND (SW): yellowish brown (10YR

5/6), wet, 100% sand, trace low plastic fines, trace

CLAY (CL): very dark gray (2.5Y 3/1), dry to moist, 100% medium plast fines, trace fine sand, fine black

Total Depth: 79 feet below ground surface

laminations 77'-78', soft-firm

Geomatrix Consultants

4" Diameter stainless steel wraparound screen with 0.020" slots

5.5" End cap

Project No. 7168

Formation material

WELL3

Page 5 of 5

68

70

72

76

78

80

82

	%	Geomatrix Consultants		Project No. 7168	
10-8 - - 12- - - 14	0.0	SILT (ML): yellowish brown (10YR 5/6), wet, ~ low plastic fines, trace fine sand, soft	00%		8" Borehole
6 8	0.0	CLAY (CL): light olive brown (2.5Y 5/3), moist, ~100% medium plastic fines, trace sand, hard			
2	0.0	Black material Dark yellowish brown (10YR 4/4), ~70% low plafines, ~30% fine to medium sand, soft	·		— Cement/bentonite grout
Sample Sample Blows/ Foot	OVM Reading	NAME (USCS): color, moist, % by wt., plast. density, s cementation, react. w/HCl, geo. inter. Surface Elevation: 576.52 (Grnd) To Asphalt, gravel base [FILL] SANDY CLAY (SC) [FILL]: very dark gray (10Y)	OC 576.13 ft.	(MSL)	DETAILS AND/OR DRILLING REMARKS - Well Vault — 12" Steel traffic cover set in concrete
AMMER WEIGHT:	NA	DROP: NA DESCRIPTION	M. Hem	SIBLE PROFESS ningway	SIONAL: REG. NO. NA WELL CONSTRUCTION
AMPLING METHOD:	10	' Sample Barrel	LOGGED E. Mans	sell	
RILLING EQUIPMEN	NT: 8	8" Diameter outer/4" Diameter inner casing		O WATER ATD:	CASING: 4" Diameter PVC
RILLING CONTRACTED STATES OF THE STATES OF T		asonic	4/9/01 TOTAL D 64.0	EPTH (ft.):	4/10/01 SCREEN INTERVAL (ft.): 46.5 - 61.5
ORING LOCATION:		Corner of Plant ~60 ft. N. of Bldg. 15 Bowser Morner		(Grnd) TOC 5	76.13 ft. (MSL) DATE FINISHED:
		- 		_	No. UAW20-60 VATION AND DATUM:

Log of Well No. UAW20-60 (cont'd)

Project No. 7168

Page 2 of 4

(feet)		DESCRIPTION NAME (USCS): solor moist % by untural plant density etructure		WELL CONSTRUCTION
(feet) Sample No.	Blows/ Foot OVM Readir	NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.		DETAILS AND/OR DRILLING REMARKS
		SILT (ML): continued	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
7 11	0.0	CLAY (CL): dark gray (5Y 4/1), moist, ~100%		
-		medium plastic fines, soft to firm, homogeneous		
4 11			444 444	
6-				
			444 444 444	
			4444	
-			444	
_				
8-	0.0	Higher plasticity than above.	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
o			744 444 444 444	
-			- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
+ +	-	Come on above high plants from 15	- 444 444 C	ement/bentonite grout
_		Same as above, high plastic fines, soft	444 444 444 444 444 444	•
			2000	
0-	0.0			
-			- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
-			9 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
_			0000	
2-			- 444	
-			- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
4 11				
]]]			1444	
4-				
- 11				
4			444	
	0.0			ontroliner
				entralizer
6-				
			444	
4 11			1444 1444 1444	
4 11			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
8-				
			4444	
4	-		4444	
] [[Same as above	4444	
			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
0-				
-				
			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	

Geomatrix Consultants

Log of Well No. UAW20-60 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION DESCRIPTION Sample Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, **DETAILS AND/OR** cementation, react. w/HCI, geo. inter. **DRILLING REMARKS** CLAY (CL): continued 32 ~1" gravel layer 32' - 32.1' Yellowish brown (10YR 5/4), firm to hard POORLY GRADED SAND (SP): light olive brown (2.5Y 5/4), moist, ~100% fine medium sand 4" Diameter Sch. 40 flush-threaded PVC riser O-rings 36 38 Cement/bentonite grout Gravel 38'-38.5' Same as above, trace fines 40 SILTY SAND (SM): 40'-40.5' POORLY GRADED SAND (SP): light olive brown (2.5Y 5/4), moist, ~100% fine medium sand 42 0.0 Bentonite chips Centralizer 46 WELL3 Page 3 of 4 **Geomatrix Consultants** Project No. 7168

PROJECT:

Morton Reading FI

Sample Sample Sample Blows/ Sample Coot Coot Coot Sample Sample Blows/ Sample Coot Sample Sam	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, ge	st. density, structure,	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
50- - - - 52- - - - 54- - - - 56-	POORLY GRADED SAND (SP): cor	ntinued	#6 Global filter pack sand 4" Diameter stainless steel wraparound screen with 0.020" slots
58-	WELL GRADED SAND WITH GRAV yellowish brown (10YR 5/4), wet, ~66 fine gravel (0 -1"), trace fines		— 8" Borehole
60-	SANDY LEAN CLAY (CL): [TILL]: lig 5/4), dry to moist, ~80% medium pla fine sand/gravel, very hard 3" - 4" cobble at 61.5'		— 5.5" End сар
62-	Dark gray (5Y 4/1)		— 4" Borehole — Bentonite chips
64-	Total Depth: 64 feet below ground so	urface	

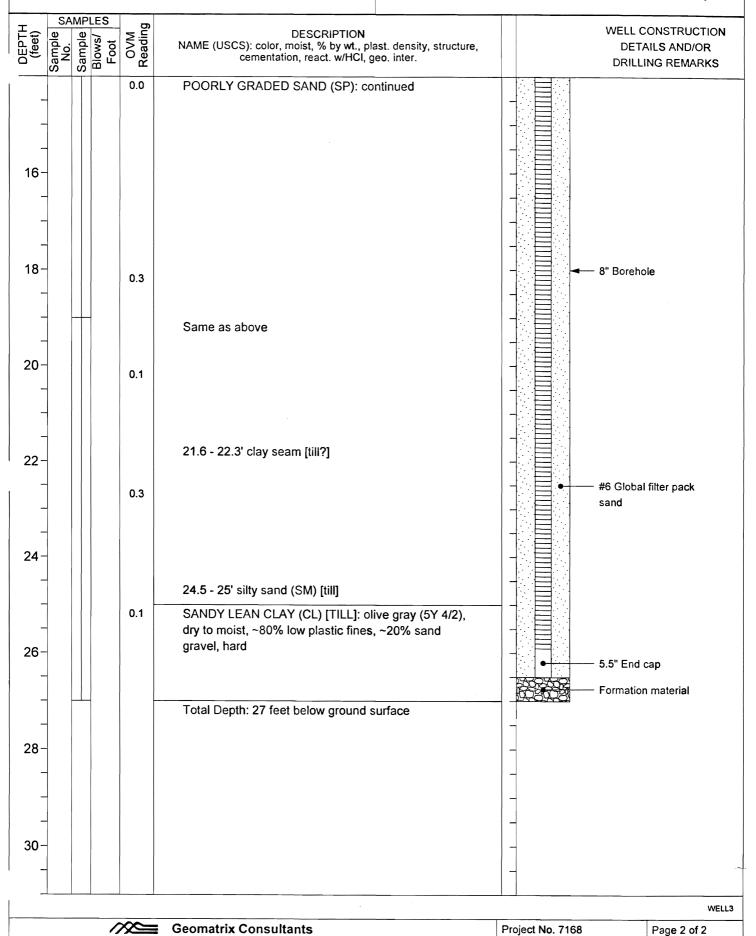
Project No. 7168

Page 4 of 4

Geomatrix Consultants

PROJECT: Mo	orton Rea	ading FI	Log of Well	No. UAW21-30
BORING LOCATIO)N: S.E	E. Bldg. 40	GROUND SURFACE ELEV 563.52 (Grnd.) TOC 5	
DRILLING CONTR	ACTOR:	Bowser Morner	DATE STARTED: 4/10/01	DATE FINISHED:
DRILLING METHO	D. Ro	otasonic	TOTAL DEPTH (ft.):	4/11/01 SCREEN INTERVAL (ft.):
			27.0 DEPTH TO WATER ATD:	11.5 - 26.5 CASING:
DRILLING EQUIPM		8" Diameter outer/4" Diameter inner casing	NA LOGGED BY:	4" Diameter PVC
SAMPLING METH	OD: 1	0' Sample Barrel	E. Mansell	
HAMMER WEIGHT	Γ: ΝΑ	DROP: NA	RESPONSIBLE PROFESS M. Hemingway	IONAL: REG. NO. NA
DEPTH (feet) Sample Sample Sample Blows/	Foot SOVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, st cementation, react. w/HCl, geo. inter.	ructure,	WELL CONSTRUCTION DETAILS AND/OR
Sar Sar Bic	T 08	Surface Elevation: 563.52 (Grnd.) To	OC 565.73 ft. (MSL)	DRILLING REMARKS
04101084		Grass [FILL] SANDY CLAY (SC) [FILL]: dark yellowish brown moist, 70% low plastic fines, 30% medium sand	תקקן תקקן ן	
2-8	0.0	abundant roots	प्याप्य सम्माप्य प्रम्य प्रम्	— Cement/bentonite grout
4- - - 6-	0.0	POORLY GRADED SAND (SP): olive brown (2 4/4), moist to dry, ~95% medium sand, ~5% fine gravel, trace fines, odor?		 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings
8-	0.1	4" silt lens	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
10 - 01101088	0.1	Same as above odor? 10-10.5' sandy clay seam [till?] gravel larger than above (1"-2")		— Bentonite chips
12-				Centralizer 4" Diameter stainless steel wraparound screen with 0.020" slots
14	<i>~</i>	Goomatrix Consultante	Droingt No. 7400	WELL3
Ĺ	//X <u>C</u>	Geomatrix Consultants	Project No. 7168	Page 1 of 2

Log of Well No. UAW21-30 (cont'd)



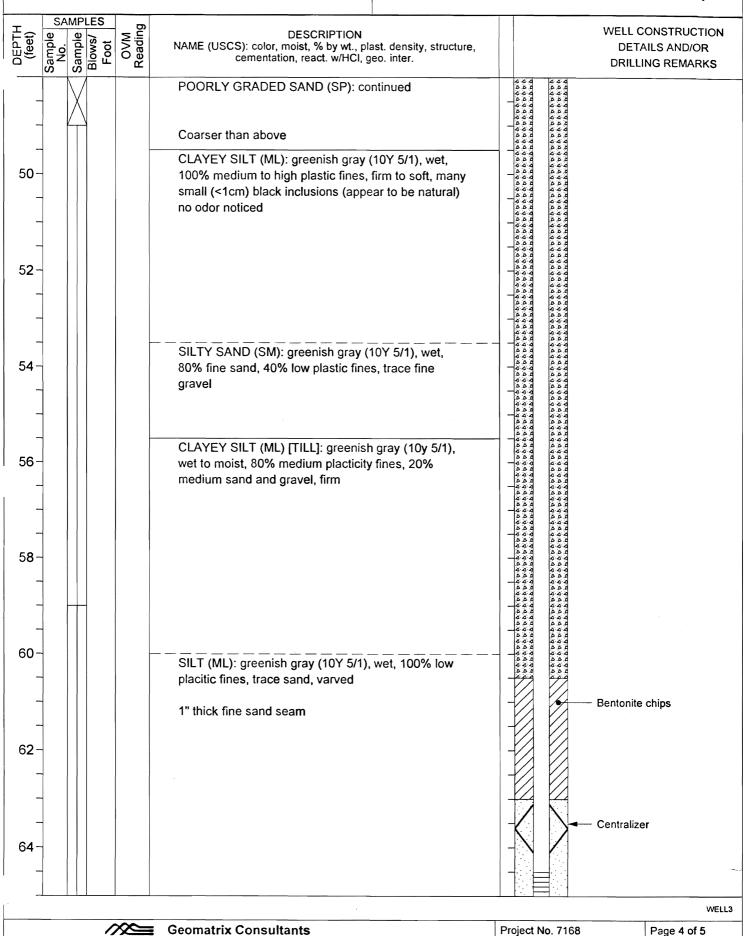
PROJECT: Morto	n Read	ding FI	Log of W	Vell No. UAW21-80
BORING LOCATION:	S.E	. of Bldg. 40	1	ELEVATION AND DATUM: OC 565.47 ft. (MSL)
DRILLING CONTRACT	 ГОR:	Bowser Morner	DATE STARTED: 4/16/01	DATE FINISHED: 4/16/01
DRILLING METHOD:	Rot	asoni c	TOTAL DEPTH (ft.): 75.0	SCREEN INTERVAL (ft.): 64.5 - 74.5
DRILLING EQUIPMEN	IT:	8" Diameter outer/4" Diameter inner casing	DEPTH TO WATER	ATD: CASING: 4" Diameter PVC
SAMPLING METHOD:	10	D' Sample Barrel	LOGGED BY:	14 Diameter FVC
HAMMER WEIGHT:	NA		J. Eidem RESPONSIBLE PRO	
SAMPLES		DESCRIPTION	M. Hemingway	NAWELL CONSTRUCTION
Sample Sample Sample Plows/ Foot	OVM	NAME (USCS): color, moist, % by wt., plast. density, seementation, react. w/HCl, geo. inter.		DETAILS AND/OR
D S B B	~		ΓOC 565.47 ft. (MSL)	DRILLING REMARKS
- 📈		0-25' taken from log UAW21-30 Grass and topsoil	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 5 5 6 4 4 4 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
2- 2- 4- 6- 8- 10-		SANDY CLAY (SC) [FILL]: dark yellowish brow 70% low plastic fines, 30% medium sand, aburoots, moist POORLY GRADED SAND (SP): olive brown, 4/4), moist-dry, 95% medium sand 5% fine gratrace fines, possible odor	ndant	8" borehole R" borehole Cement/bentonite grout
12-			4 4 4 4 4 4	4" Diameter PVC riser
12 -			4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	J.DD .C

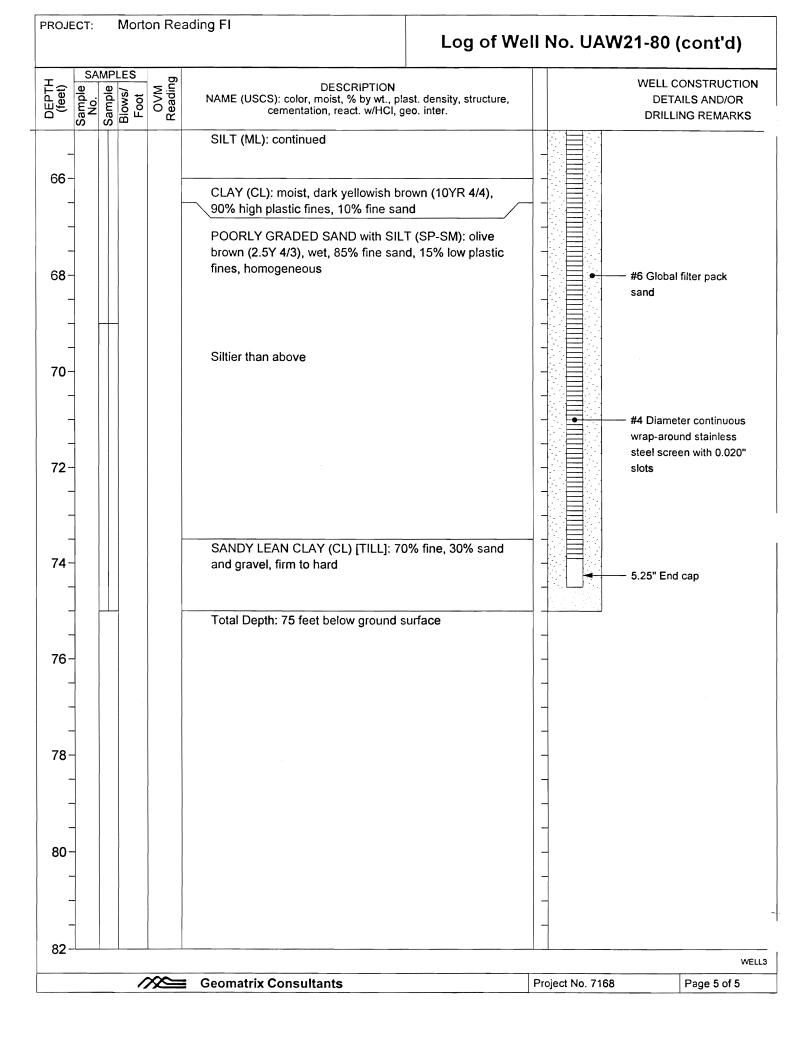
PROJECT: Morton Re	eading FI	Log of Well	No. UAW21-8	O (cont'd)
_ SAMPLES			1	
Creet) Sample No. Sample Blows/ Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	est. density, structure, eo. inter.	DI	L CONSTRUCTION ETAILS AND/OR LLING REMARKS
16-	POORLY GRADED SAND (SP): co	dark grayish	dangaranganganganganganganganganganganganganga	nt/bentonite grout
24-	brown (2.54 4/2), moist, 80% mediu fines, 20% medium to coarse sand,	m to high plastic	व्याप्त्रम् व्याप्त्यम् व्याप्त्रम् व्याप्त्यम्यम्यस्यम्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यम्यस्यस्यम्यस्यम्यस्यम्यस्यस्यस्यम्यस्यस्यस्यम्यस्यस्यस्यस्यस्यस्यस्यस्यस्यस्यस्यस्यस्	neter PVC riser

WELL3

PROJECT: Morton Rea	nding FI	Log of Wel	l No. UAV	/21-80 (cont'd)
DEPTH (feet) Sample No. Sample Blows/ Garante Coot CovM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
32- 34- 34- 36- 38- 40- 40- 44- 44- 46- 46- -	Dark greenish gray (5GY 4/1), firm POORLY GRADED SAND (SP): gray 5/1), moist to wet, 95% medium san fines, few cobble	eenish gray (10Y		DRILLING REMARKS — Cement/bentonite grout — 8" Borehole — Centralizer — 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings
48	Geomatrix Consultants		Project No. 7168	Page 3 of 5

Log of Well No. UAW21-80 (cont'd)





PROJE	CT:		Morto	on Rea	ading FI		Log of Well No. UAW	/22-20
BORING	3 LO	CA.	TION:	S.	of Bldg. 16	1	OUND SURFACE ELEVATION AND DA 7.99 (Grnd.) TOC 557.66 ft. (MS	
DRILLI	1G C		TRAC		Boart Longyear	DAT	E STARTED: DATE FINIS	
DIVICEI	••• C					9/5		TERVAL (ft.):
RILLII	NG M	ET	HOD:	Ro	otasonic	25.	0 10-20	(IL.).
DRILLII	NG E	QU	IPMEN	NT:	Gussbach Sonic	DEF 12.	PTH TO WATER ATD: CASING: 5' 4" Diameter	or DVC
CAMPI	INIC		THOD		10' Core Barrel		GGED BY:	EIFVC
SAMPL	ING		INOD.		Cole Ballel		Jennings SPONSIBLE PROFESSIONAL:	REG. NO.
HAMME	ER W	ΈIC	GHT:	N/	A DROP: NA		Hemingway	NA NA
DEPTH (feet)	<u>e</u>		Blows/ ਜ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast cementation, react. w/HCl, geo	. density, structure . inter.) ,	STRUCTION S AND/OR
<u> </u>	Samp	San	용	Re	Surface Elevation: 557.9	9 (Grnd.) TOC 557	7.66 ft. (MSL)	REMARKS
					CLAYEY GRAVELLY SAND (SP): red	·	Well Vault	
_					wet, ~60% fine to coarse sand, ~30%	gravel (<1.5"),	12" Steel tra	ffic cover set
, -				0.0	~10% red clay, stiff, plastic, loose		- 444 444 III CONCIETE	
, -								
2-	181				SANDY GRAVELLY CLAY (CL): gray		A A A A A A A A A A A A A A A A A A A	
	090501181	Ţ			brown, damp, ~70% clay, ~20% fine t ~10% gravel (<1"), stiff, moderately p		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Sch. 40
					1070 graver (117), still, illoderately p	astic	្នុំកំនុំ នុំកំនុំ flush-threade	ed PVC riser
				0.0			वैदेव वैदेव with O-rings	
4-								
_							Cement/ben	tonite grout
		-	-	0.0				
_				0.0			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
6-							ଜନ୍ୟ ଜନ୍ୟ ଜନ୍ୟ ଜନ୍ୟ ଜନ୍ୟ ଜନ୍ୟ	
٥							2004 2004 2004 2004 2004 2004 2004 2004	t
_		l					— টুটুরী টু টুরী — Bentonite ch	ips
_				0.1				
_					CDAVELLY CAND (CD); block wet	700/ fine to		
8-					GRAVELLY SAND (SP): black, wet, ~ medium sand, ~30% gravel (<1") dec		- 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
					volume downward, loose, moderate o		444 444	
-							● 15/30 Sand	
_				0.0				
40								
10-								
-								
-	11182			0.9			- 8" Borehole	
	090501182	Ŧ						
12-								
_								
					Becomes saturated at 12.5'			
_				0.0	CLAY (CL): dark green, damp, stiff, n	noderately		
_					CLAY (CL): dark green, damp, stiπ, n plastic	ioueraleiy		
14-					·		<u> </u>	WELL3
			1	% =	Geomatrix Consultants		Project No. 7168 F	Page 1 of 2

A CLAY (CL): continued CLAY (CL): continued CRAVELLY SAND (SP): black, saturated, -70-80% fine to medium sand, -30% - 20% gravel (<1") fining and decreasing downward, loose SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, -85% clay, -10% fine to medium sand, -5% gravel (<1") fining and decreasing downward, loose SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, -85% clay, -10% fine to medium sand, -5% gravel (<1") fining and decreasing downward, loose SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, -85% clay, -10% fine to medium sand, -5% gravel (<1"), fining and decreasing downward, loose SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, -85% clay, -10% fine to medium sand, -5% gravel (<1"), fining and bed at 21.5" and 23.8", stiff, moderately plastic Total Depth: 25 feet below ground surface				Log of W	ell No. UAW22-20 (cont'd)
CLAY (CL): continued CLAY (CL): continued 4" Diameter stainless steel wraparound screen with 0.020" slots GRAVELLY SAND (SP): black, saturated, -70-80% fine to medium sand, -30% - 20% gravel (<1") fining and decreasing downward, loose SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, -85% clay, -10% fine to medium sand, -5% gravel (<1"), thin sand bed at 21.5" and 23.8", stiff, moderately plastic Bentonite chips Total Depth: 25 feet below ground surface	Sample No.	Sample M Blows/ The Foot	OVM Reading	NAME (USCS): color, moist, % by wt., plast, density, structure,	DETAILS AND/OF
20- SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, ~85% clay, ~10% fine to medium sand, ~5% gravel (~1"), thin sand bed at 21.5' and 23.8', stiff, moderately plastic Bentonite chips Total Depth: 25 feet below ground surface	16-		0.1	GRAVELLY SAND (SP): black, saturated, ~70-80% fine to medium sand, ~30% - 20% gravel (<1") fining	steel wraparound scree
SANDY GRAVELLY CLAY (CL): dark gray, damp to wet, ~85% clay, ~10% fine to medium sand, ~5% gravel (<1"), thin sand bed at 21.5' and 23.8', stiff, moderately plastic Total Depth: 25 feet below ground surface Total Depth: 25 feet below ground surface	- -		0.9		
Total Depth: 25 feet below ground surface 28	-		0.4	wet, ~85% clay, ~10% fine to medium sand, ~5% gravel (<1"), thin sand bed at 21.5' and 23.8', stiff,	
	-			Total Depth: 25 feet below ground surface	
30-	- - 28- -				
	30-				

ROJECT:			ading FI			No. UAW23-20
ORING LOC	CATION:	~5'	W. of STR10; Near N.W. Corner Bldg	559.52	2 (Grnd.) TOC	VATION AND DATUM: 559.05 ft. (MSL)
RILLING CO	ONTRACT	ΓOR:	Boart Longyear		STARTED:	DATE FINISHED:
				9/8/01	DEPTH (ft.):	9/8/01 SCREEN INTERVAL (ft.):
RILLING ME	ETHOD:	Ro	tasonic	26.0	DEI 111 (II.).	15-25
RILLING EC	OUIPMEN	т.	Gussbach Sonic	DEPTH	TO WATER ATD:	CASING:
				15'	'D DV	4" Diameter PVC
AMPLING N	METHOD:	1	0' Core Barrel	T. Jen		
AMMER WI	FIGHT:	NA	DROP: NA	RESPO	NSIBLE PROFES	SIONAL: REG. NO.
			·	<u>М.</u> Не	mingwa y	NA
	Sample Blows/ Sample Sa	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. cementation, react. w/HCl, geo.	density, structure,		WELL CONSTRUCTION DETAILS AND/OR
Sample (fer property)	Sample Blows/ Foot	0 %		? (Grnd.) TOC 559.05	ft (MSL)	DRILLING REMARKS
- 0,			0-26' taken from log of STR10	. (Gilla.) 100 339.03	II. (MSL)	- Well Vault
4			Asphalt base		4 4	12" Steel traffic cover set
			•		100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	in concrete
			SAND WITH CLAY (SC) [FILL]: some	black material	444 444 444 444 444 444 444 444 444 44	
7		0.7			444 444	
2-					444	
4						
					1944	
					444 444	
7		F	SANDY CLAY (SC): very dark gray (2.	.5Y 3/1), moist.	444 444	
4-		0.0	~80% low plastic fines, ~20% medium		- 444 444 - 444 444	— 4" Diameter Sch. 40
4 1		0.0				flush-threaded PVC riser
					1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	with O-rings
					- a a a a a a a a a a a a a a a a a a a	
4					444 444	
6-					444 444	Cement/bentonite grout
4						
					444 444 444 444	
		0.1	CLAY (CL): olive brown (2.5Y 4/3), mo		100 B 000 B	
1			plastic fines, ~10% fine sand, firm to h	ard		
8-					1444	
4						
					444	
		0.4	Same as above		4444	
7						
10-			Olive (5V 4/2)			
4			Olive (5Y 4/3)			Bentonite chips
_						
7			11 - 11.4' black discoloration, chemica	al odor, very		
		1.0	soft, increasing sand content ~30%			
12-		-	CANDY LANCIAN CONTROL			
			SANDY LEAN CLAY (CL) [TILL]: olive 4/3), moist, ~85% low plastic fines, ~1			
			gravel, hard	J /0 Sailu aliu		
7		0.1	J. 2. 2.,		- •	15/30 Sand
-						
14						
17			·			WEL

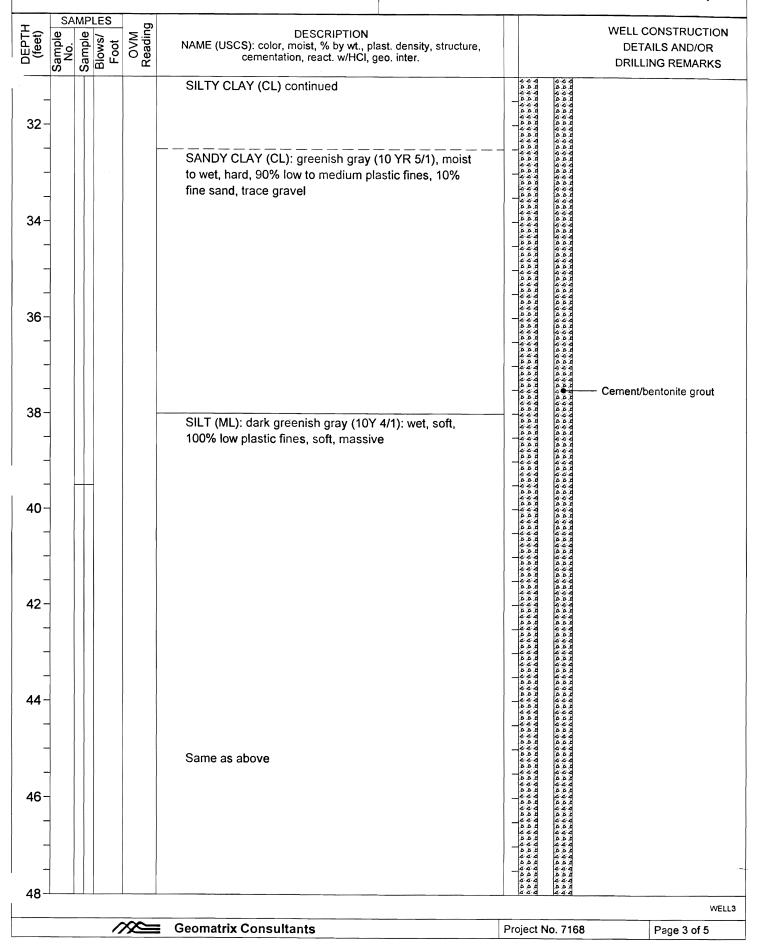
PROJE	ECT:		Mort	on Re	ading FI	1 5 \ \ / -		V- 114V	100.00	41.15
						Log of We	וו	NO. UAV	V23-20	(cont'd)
DEPTH (feet)	Sample S	Sample 3	Blows/ S Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, eo. inter.			DET	ONSTRUCTION AILS AND/OR ING REMARKS
_					SANDY LEAN CLAY (CL) [TILL]: co	ontinued				
16-				0.4	Dark greenish gray (10Y 3/1), very the ~50% fine to medium grained sand					
18-					Same as above		-			
20-										er stainless paround screen " slots
22-				1.2	21.7 - 22' gravel seam					
24-				1.0					— 0.5' End o	ap
26-			1		Total Depth: 26 feet below ground s	surface				
-										
-							$\lfloor \rfloor$			
28-										
-	-									
-	-						$ $			
-							-			
30-							$ \cdot $. ••••
-	1						-			
										WELL3
			1	%	Geomatrix Consultants		Pro	ject No. 7168		Page 2 of 2

PROJECT: Morton Rea	ading FI	Log of Well	No. UAW24-70
BORING LOCATION: Su	upply Warehouse (Bldg. 7) Ramp; ~6' NE of S	GROUND SURFACE ELEV 556.37 (Grnd.) TOC 5	ATION AND DATUM: 75.9 ft. (MSL)
DRILLING CONTRACTOR:	Boart Longyear	DATE STARTED: 9/6/01	DATE FINISHED: 6/7/01
RILLING METHOD: RO	otasonic	TOTAL DEPTH (ft.): 82.0	SCREEN INTERVAL (ft.): 63-73
DRILLING EQUIPMENT:	Gussbach Sonic	DEPTH TO WATER ATD: NA	CASING: 4" Diameter PVC
SAMPLING METHOD: 1	10' Core Barrel	LOGGED BY: T. Jennings	
HAMMER WEIGHT: NA	A DROP: NA	RESPONSIBLE PROFESSI M. Hemingway	ONAL: REG. NO. NA
DEPTH (feet) Sample No. Sample Blows/ Sample Coot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, str cementation, react. w/HCl, geo. inter.	ucture,	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
N N N M T	Surface Elevation: 556.37 (Grnd.) TO 0'-70' taken from log of STR06	OC 575.9 ft. (MSL)	Well Vault
2- - - - - - - - - - - - - - - - - - -	Asphalt Road base (gravel) CLAYEY SAND (SC): greenish black (10Y 2.5/1 transitional color change light gray reddish mottly yellowish brown (10YR 5/6), moist, 60% fine sar 40% medium plastic fines, hard, trace gravel (1" SANDY CLAY (CL): light olive brown (2.5YR 5/4 light gray mottling, moist to wet, hard, 70% fines fine sand, 5% gravel (1" -2") Dark greenish gray (10Y 4/1), moist, hard, 90% 10% fine sand, trace gravel, hard	ng, d, 3")	- 12" Steel trafic cover set in concrete - 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings
//	■ Geomatrix Consultants	Project No. 7168	Page 1 of 5
.,,-			

PROJECT: Morto	n Reading FI	Log of Well No. UA	W24-70 (cont'd)
Sample Sample Sample Sample Plows/ Sample Pl	NAME (USCS): color, moist cementation, re	SCRIPTION i, % by wt., plast. density, structure, eact. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	SANDY CLAY (CL): cor	ntinued 244 444 444 444 444 444 444 444 444 44	
	SILTY CLAY (CL): mois plastic fines, hard, trace subrounded	t to wet, 100% medium gravel (1") subangular to	
16-			
18-	Olive (5Y 5/3), light gray	A A A A A A A A A A A A A A A A A A A	
	Becomes softer with dep	pth	
20-	Same as above	**************************************	
22-		\(\alpha \) \(
24-			— Centralizer
26-		२००० २०० <td></td>	
-		- विश्व क्ष्यक्षा स्वयं क्ष्यक्ष क्षयक्ष क्ष्यक्ष क्ष क्ष्यक्ष क्ष्यक्ष क्ष्यक्ष क्ष्यक्ष क्ष क्ष क्ष्यक्ष क्ष क्ष्यक्ष क्ष क्ष क्ष क्ष क्ष क्ष क्ष क्ष क्ष	
28-			
30-	Same as above		
		444 644 144 144 144 144 144 144	
	Geomatrix Consultants		WELI

PROJECT: Morton Reading FI

Log of Well No. UAW24-70 (cont'd)



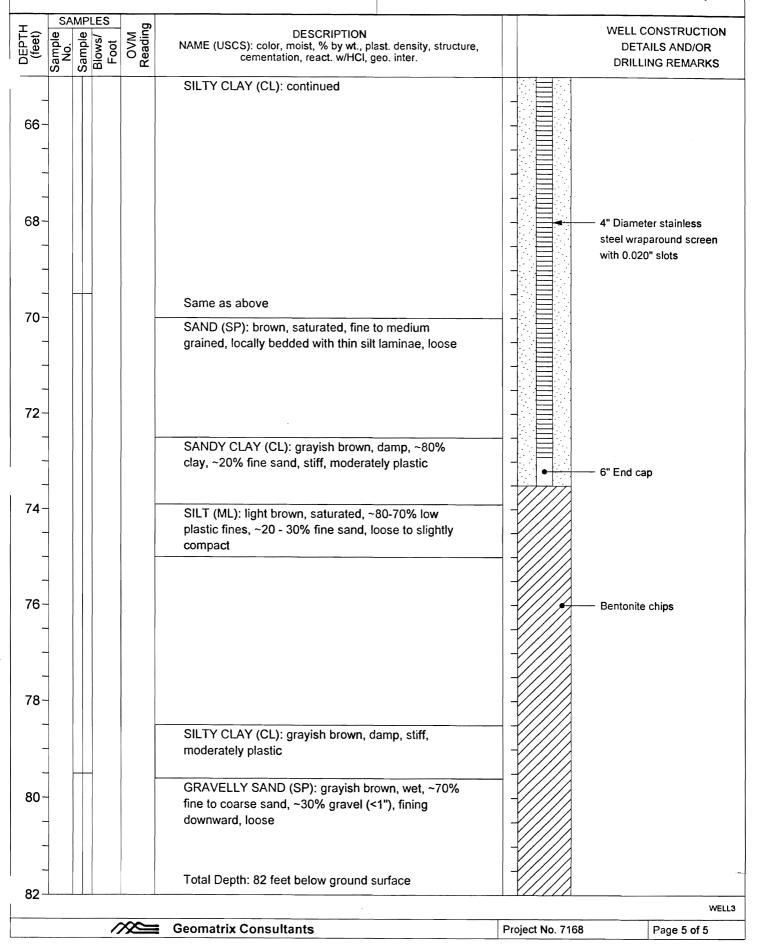
Log of Well No. UAW24-70 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample Blows/ Foot **DESCRIPTION** NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR DRILLING REMARKS** SILT (ML): continued Same as above 50 52 54 8" Borehole 56 Increasing hardness with depth 58 Bentonite chips Same as above 60 62 15/30 Sand Centralizer 64 WELL3 /XX **Geomatrix Consultants** Project No. 7168 Page 4 of 5

PROJECT:

Morton Reading FI

PROJECT: INIORON Reading FT

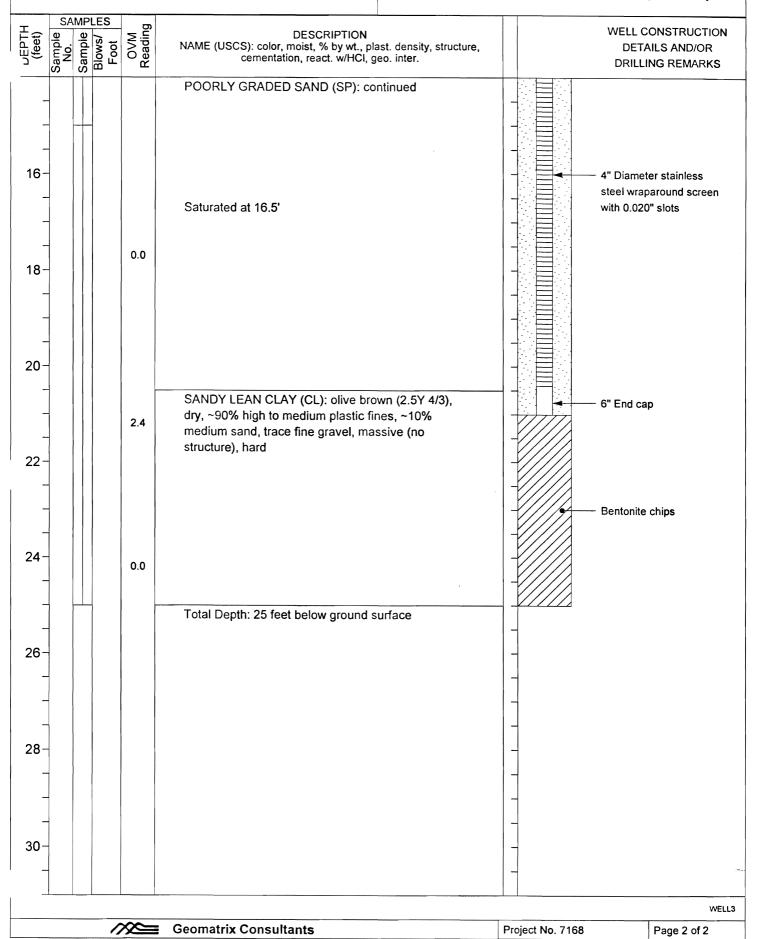
Log of Well No. UAW24-70 (cont'd)



PROJECT:	Morton Rea	ading FI	Lo	g of Well I	No. UAW25-20
BORING LOCA	ATION: W	of Bldg. 40; Adjacent to STR01	1		ATION AND DATUM: 56.07 ft. (MSL)
	ITD A OTOD	Dood Law	DATE ST		DATE FINISHED:
DRILLING CON	NTRACTOR:	Boart Longyear	9/7/01		9/8/01
DRILLING MET	тнор: Ro	otasonic	25.0	EPTH (ft.):	SCREEN INTERVAL (ft.): 11-21
DRILLING EQL	JIPMENT:	Gussbach Sonic	16.5'	O WATER ATD:	CASING: 4" Diameter PVC
SAMPLING ME	ETHOD:	10' Core Barrel	LOGGED T. Jenn		
HAMMER WEI	GHT: NA	A DROP: NA		SIBLE PROFESSI	ONAL: REG. NO.
Cfeet) (feet) Sample No. Sample		DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, cementation, react. w/HCl, geo. inter.			WELL CONSTRUCTION DETAILS AND/OR
San San	B R O S	Surface Elevation: 5 61.95 (Grnd.)	TOC 556.07 f	(MSL)	DRILLING REMARKS
		0-25' taken from log of STR01		4	Well Vault
-		Asphalt and road base			 12" Steel traffic cover set
-		Sub base - gravel [FILL]		1 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	in concrete
				444 444	
	0.0			444 444	- 4" Diameter Sch. 40
2-				-044 044 044 044	flush-threaded PVC riser
-		CLAVEY CAND (CO). Vone dod, brown (40VD	2/2)		with O-rings
		CLAYEY SAND (SC): Very dark brown (10YR moist, ~100% low to medium plastic fines	(2/2),	444	
		moist, ~ 100% low to medium plastic lines		9 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
-				_ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
4-				444 444	Cement/bentonite grout
				444 444	·
7 11	0.0				
	-				
4 11				444 444	
6-					
-		DOODLY CRADED SAND WITH CRAVEL (S	201.	1-1/2 1/2	
		POORLY GRADED SAND WITH GRAVEL (\$ Yellowish brown (10YR 5/4), dry to moist, ~80			- Bentonite chips
	0.0	medium sand, ~20% gravel (1" to 5"), trace file			Denterme omps
7 11		mediam dana, 20% graver (1 to 0), trade in	1100		
8-					
		<u> </u>			
-		CLAYEY SAND (SC): brown (10YR 5/3), moi	st, ~60%		
_		fine sand, ~40% medium plastic fines			— 15/30 Sand
40					
10-				1784 84	
-	0.0	CLAYEY SILT (ML): brown (10YR 5/3), moist			
	0.0	fine sand, ~40% medium plastic fines, firm, m			
		laminated, iron-colored (horizontal) discolorat	tion		
7		(loess?)			
12-		DOODLY CDADED CAND (CD) to (40)	D E (0)	┥┩╣目╗┝	— 8" Borehole
		POORLY GRADED SAND (SP): brown (10Y)	-		
		dry, ~90% medium to fine sand, ~5% fine gra ~5% fines	ıvcı,		
7		5 70 m/c3			
_				-	
14	0.0				
14					WELL
	/XC	■ Geomatrix Consultants		Project No. 7168	Page 1 of 2

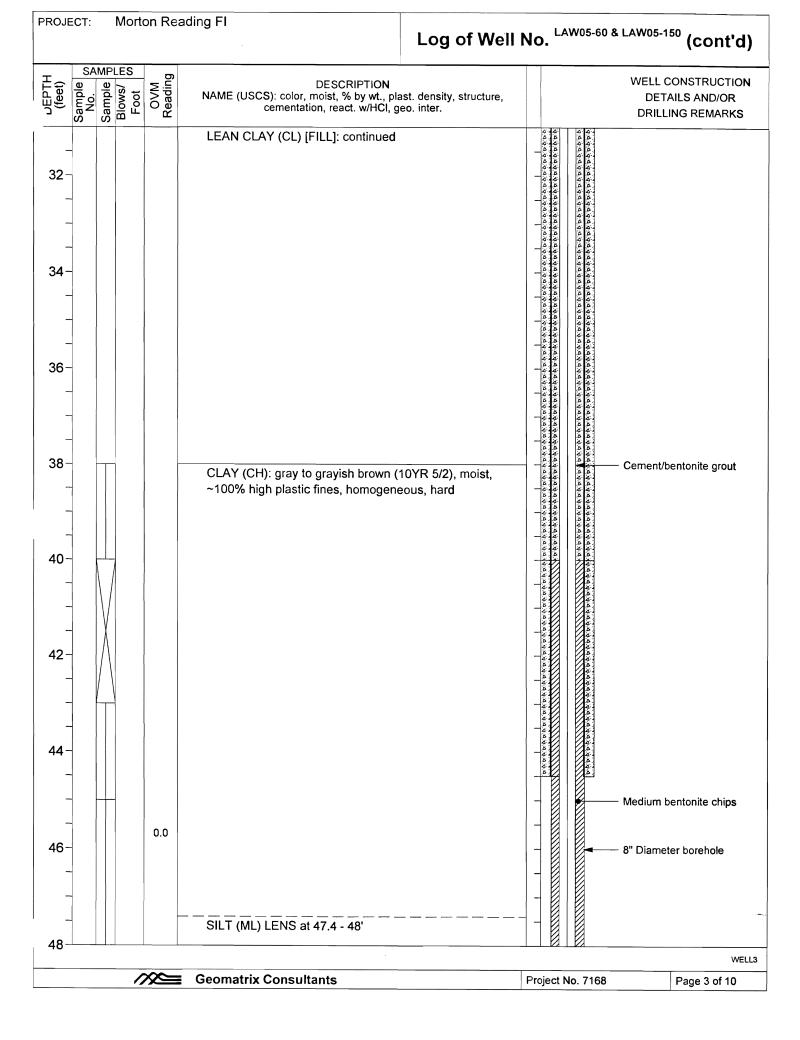
PROJECT: Morton Reading FI

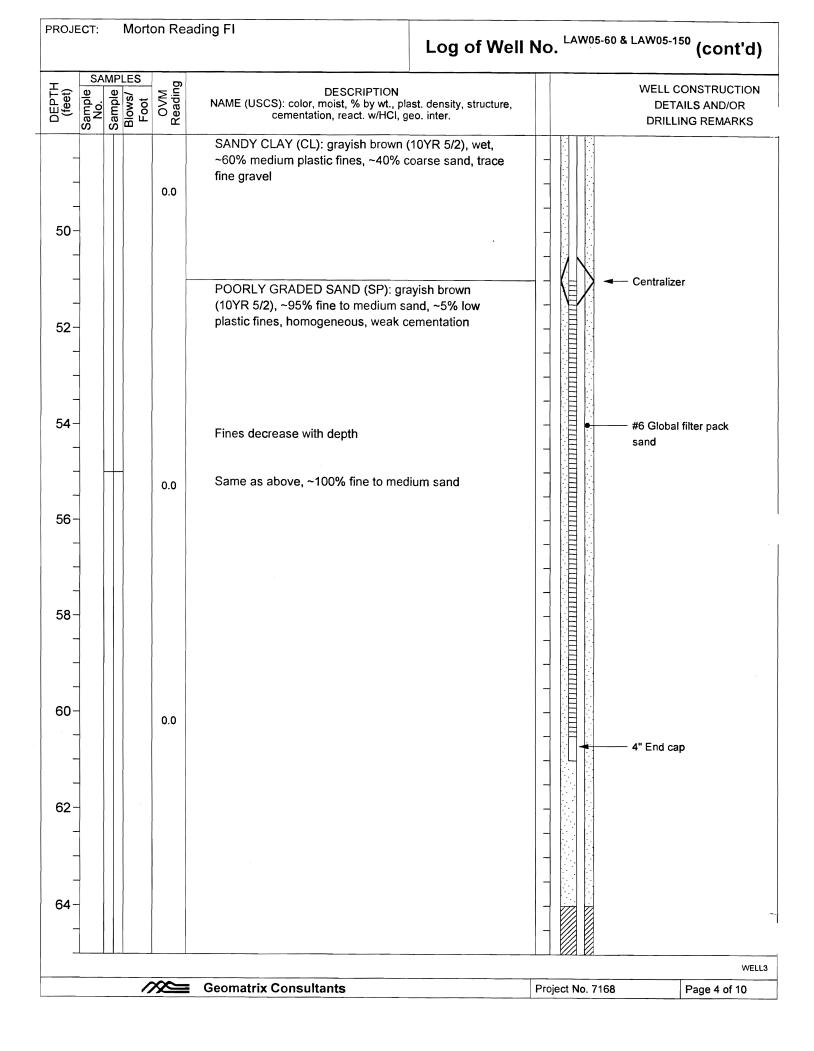
Log of Well No. UAW25-20 (cont'd)



PROJECT: Morton Re	ading FI	Log of Well No	LAW05-60 & LAW05-150
BORING LOCATION: ~{	B' N. of UAW05	GROUND SURFACE ELEV. 553.67 (Gmd.) TOC 05-60 553.25 ft. 0	ATION AND DATUM: 5-150 553.35 ft. (MSL)
DRILLING CONTRACTOR:	Boart Longyear	DATE STARTED: 3/4/02	DATE FINISHED: 3/14/02
RILLING METHOD: R	otasonic	TOTAL DEPTH (ft.): 155.0	SCREEN INTERVAL (ft.): 51-61 143-153
DRILLING EQUIPMENT:	Gussbach Sonic	DEPTH TO WATER ATD: NA	CASING: 2" Diameter
SAMPLING METHOD:	4" Diameter Sample Barrel	LOGGED BY: E. Mansell	
HAMMER WEIGHT: N	A DROP: NA	RESPONSIBLE PROFESSI M. Hemingway	ONAL: REG. NO.
A Control of the cont	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, sementation, react. w/HCl, geo. inter. Surface Elevation: Description taken from log of UAW05-20 LEAN CLAY (CL) [FILL]: black (2.5Y 2.5/1) Dark brown POORLY GRADED SAND (SP): moist, ~90% medium sand, ~10% gravel	structure,	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS Well Vault 12" Steel traffic cover set in concrete Protective steel casing 14-1/4" Diameter borehole Cement/bentonite grout Cement/bentonite grout
10- - - - 12- - -	LEAN CLAY (CL) [FILL]:	জ্ন ক্নক্রক্রক্রক্রক্রক্রক্রক্রক্রক্রক্রক্রক্রক	
14			WELL
/X=	■ Geomatrix Consultants	Project No. 7168	Page 1 of 10

PROJI	ECT:	N	Mort	on Rea	ding FI	Log of Well	No. LAW05-6	o & LAW05-150 (cont'd)
DEPTH (feet)	Sample No.	Sample M	Foot Sa	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pl cementation, react. w/HCl, g	ast. density, structure, geo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
16- - - - - - - - - - - - - - - - - - -					LEAN CLAY (CL) [FILL]: continued		৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽৽	2" Diameter flush-threaded Sch. 40 PVC riser with O-rings
			/	** =	Geomatrix Consultants		Project No. 716	





PROJEC	CT: Morton Rea	ding FI	Log of Well I	No. LAW05-6	^{0 & LAW05-150} (cont'd)
JEPTH (feet)	Sample No. Sample Blows/ Sample COVM COVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	est. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
66 -	1.3	POORLY GRADED SAND (SP): cor	ntinued		Transition from 8" to 6-1/4" diameter borehole
68-	0.0				
70-	0.0				
74-	0.0				— Bentonite Chips
78-		~90% fine to medium sand, ~10% lo	ow plastic fines		
82	//XS	Geomatrix Consultants			WELL3
		Comatrix Consultants		Project No. 716	8 Page 5 of 10

Log of Well No. LAW05-60 & LAW05-150 (cont'd) **SAMPLES** OVM Reading DEPTH (feet) Sample WELL CONSTRUCTION Sample No. DESCRIPTION Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS POORLY GRADED SAND (SP): continued 84 0.0 84.5 - 85' (silt lens, 1/8" black laminations, no odor) 86 ~85% fine to medium sand, ~15% low plastic fines, moderate cementation 88 0.0 90 92 0.0 94 Same as above 96 90% medium to fine sand, ~10% fines 1.5 98 WELL3 **Geomatrix Consultants** Project No. 7168 Page 6 of 10

PROJECT:

Morton Reading FI

Morton Reading FI PROJECT: Log of Well No. LAW05-60 & LAW05-150 (cont'd) SAMPLES OVM Reading ≟PTH (feet) WELL CONSTRUCTION Sample DESCRIPTION Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR DRILLING REMARKS** 0.0 POORLY GRADED SAND (SP): continued 100 102 104 Same as above 106 108 110 112 114 Same as above

WELL3

Geomatrix Consultants

Project No. 7168

Page 7 of 10

116

PROJEC	T: Morton Rea	ading FI	Loa of Well	No. LAW05-60 &	LAW05-150 (cont'd)
	SAMPLES				
DEPTH (feet) Sample	Sample Blows/ Sample Coot CovM CovM CovM CovM CovM CovM CovM CovM	DESCRIPTION NAME (USCS): color, moist, % by wt., pla cementation, react. w/HCl, g	ast. density, structure, eo. inter.		WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
		POORLY GRADED SAND (SP): co	ntinued		
		Darker color with depth (dark grayis (sand appears cemented)	h brown), loose		
118-		(cana appears comonica)			
-					
120-					
-					
122-					
-					
_					
124-					
_					
		Same as above, loose			
100					
126-				1 — VA VA	
128-					
120					
130-					
-					
132-					
-					
					NATE LA
	///	Geomatrix Consultants		Project No. 7168	Page 8 of 10

PROJECT: Morton Reading FI Log of Well No. LAW05-60 & LAW05-150 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample **DESCRIPTION** Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, **DETAILS AND/OR** cementation, react. w/HCl, geo. inter. DRILLING REMARKS POORLY GRADED SAND (SP): continued 134 Same as above 136 Medium bentonite chips 3" Cobbles at 137' - 139', subangular to rounded, fossiliferous 138 140 Stainless steel centralizer 144 2" Cobbles at 144' - 145', subangular to rounded 2" Diameter 0.020" CLAYEY SAND WITH GRAVEL (SC): grayish brown slotted stainless steel (10YR 5/2), wet, ~60% medium sand, ~30% medium wraparound screen plastic fines, ~10% gravel (1-2" round 146 WELL GRADED SAND (SW) WITH GRAVEL: grayish brown (10YR 5/2), wet, ~80% well graded sand, ~15% 1-3" cobbles, ~5% low plastic fines, 148loose 150 WELL3 **Geomatrix Consultants** Project No. 7168 Page 9 of 10

PROJEC	ст: Мо	rton Rea	iding FI		- I AW05-60 & I AV	V05-150
				Log of Well N	lo.	vos-150 (cont'd)
DEPTH (feet)	Sample No. Sample Blows/	Foot OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., placementation, react. w/HCl, g	ast. density, structure, eo. inter.		ELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
152-			WELL GRADED SAND with GRAV continued	EL (SW):		
- 154-			CLAY (CL): dark gray (5Y 4/1), dry, fines, ~10% fine sand, homogeneous SHALE: greenish gray (5G 6/1), dry	us, very hard	4" E	∈nd cap
			Total Depth: 155 feet below ground	surface		
156 -						
158-						
160-						
162-						
164 -		×				
166-						
						WELL3
		/XC=	Geomatrix Consultants	ı	Project No. 7168	Page 10 of 10

DRILLING CONTRACTOR: Boart Longyear DATE STARTED SAME STA	PROJECT: Morton Rea	ding FI	Log of Well	No. LAW12-60
DRILLING CONTRACTOR: Boart Longyear Surface Su	BORING LOCATION: ~7'	W. of UAW12-20		
RILLING METHOD: Rotasonic	DRILLING CONTRACTOR:	Roart Longvear	DATE STARTED:	DATE FINISHED:
SAMPLING METHOD: ROBERT OF CONTROL OF CONTR				
SAMPLING METHOD: 10' Core Barrel LOGGED BY: T. Jennings HAMMER WEIGHT: NA DROP: NA RESPONSIBLE PROFESSIONAL: REG. NO. M. Hemingway NAME (USCS): color, moist, % by wt., plast ensaty, structure, comentation, read. whireld, geo. inter. Surface Elevation: 555.78 (Gmd.) TOC 554.89 ft. (MSL) O'-18' taken from log of UAW12-20 Asphalt Sand and road base material CLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor Wett Construction DETAILS AND/OR DRILLING REMARKS WELL	RILLING METHOD: Rot	asonic	66.0	55-6 5
SAMPLING METHOD: 10° Core Barrel T. J. dennings HAMMER WEIGHT: NA DROP: NA RESPOSIBLE PROFESSIONAL: REG. NO. NA HEMINING WEIGHT: NA DROP: NA RESPOSIBLE PROFESSIONAL: NA NA DROP: NA RESPOSIBLE PROFESSIONAL: NA NA NA DROP: NA HEMINING WEIGHT: NA HEMINING RESPOSIBLE PROFESSIONAL: NA NA NA DROP: NA HEMINING RESPONSIBLE PROFESSIONAL: NA NA NA DROP: NA HEMINING RESPONSIBLE PROFESSIONAL: NA NA NA HEMINING RESPONSIBLE PROFESSIONAL: NA NA HEMINING RESPONSIBLE PROFESSIONAL: NA NA NA HEMINING RESPONSIBLE PROFESSIONAL: NA HEMINING RESPONSIBLE PROFESSIONAL: NA HEMINING RESPONSIBLE PROFESSIONAL: NA NA HEMINING RESPONSIBLE PROFESSIONAL: NA HEMINING RESPO	DRILLING EQUIPMENT:	Gussbach Sonic		
HAMMER WEIGHT: NA DROP: NA RESPONSIBLE PROFESSIONAL: NA NA DROP: NA RESPONSIBLE PROFESSIONAL: NA NA NA DROP: NA RESPONSIBLE PROFESSIONAL: NA NA NA DROP: NA NAME (USCS): color, most, % by wt. pleat densily, structure, comenication, react, wirthCl, got, inter. Surface Elevation: 555.78 (Grind.) TOC 554.89 ft. (MSL) O'-18' taken from log of UAW12-20 Asphalt Sand and road base material CLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS WELL CONSTRUCTION DETAILS AND/OR DRIL	SAMPLING METHOD: 10	D' Core Barrel	LOGGED BY:	
SAMPLES SAM			RESPONSIBLE PROFESS	IONAL: REG. NO.
A NAME (USCS): color, moist, % by wf., plast, density, structure, cementation, read: which cago interface and provided			M. Hemingway	NA NA
O'-18' taken from log of UAW12-20 Asphalt Sand and road base material CLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' 8" ID 8.5/8" OD Carbon steel casing POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor Well Vault 12' Steel traffic cover set in concrete 16" Hole CCLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' 8" ID 8.5/8" OD Carbon steel casing Cement/ bentonite grout Cement/ bentonite grout Mull Vault 12' Steel traffic cover set in concrete 16" Hole CCLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' 8" ID 8.5/8" OD Carbon steel casing Cement/ bentonite grout Cement/ bentonite grout Cement/ bentonite grout To black, moist, 90% medium plastic fines, trace gravel, firm, chemical odor 10 of 10 o		NAME (USCS): color, moist, % by wt., plast. density,	structure,	DETAILS AND/OR
Asphalt Sand and road base material CLAY (CL): black, moist, 100% medium plastic fines, trace gravel, firm, chemical odor, black staining at 4'-15' 8" ID 8 5/8" OD Carbon steel casing POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor wet wet	Sa Sa R		TOC 554.89 ft. (MSL)	
8- POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor 10- wet wet	2-	Asphalt Sand and road base material	4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	12" Steel traffic cover set in concrete
POORLY GRADED SAND (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor 10- wet wet Poorly Graded Sand (SP): black, moist, 90% medium sand, 10% gravel 1/2"-1", chemical odor wet WELL WELL		trace gravel, firm, chemical odor, black stainin	c fines, g at বিষয় ব্যক্ষ ব্যক ব্যক্ষ ব্যক্য ব্যক্ষ ব্	
medium sand, 10% gravel 1/2"-1", chemical odor	6-	POORLY CRADED SAND (SP): black moist		
14 - WELL	10-		odor 444	flush-threaded PVC riser
WELL		wet		
				WELL3

PROJECT: Morton Reading FI Log of Well No. LAW12-60 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample No. Sample Blows/ DESCRIPTION Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS POORLY GRADED SAND (SP): continued CLAY (CL): dark gray to black, damp, 80% clay, ~10% fine to medium sand, ~10% gravel (<2"), very stiff, moderately plastic 16 18 GRAVELLY SAND (SP): black, saturated, ~70% fine to coarse sand, ~30% gravel (<2"), loose, heavy chemical odor 20 CLAY (CL): dark gray, damp, very stiff, moderately plastic 22 Cement/bentonite grout Cement/bentonite grout 24 26 SANDY GRAVELLY CLAY (CH): dark greenish gray, damp, ~70% clay, ~20% fine to medium sand, ~10% gravel (<1.5"), stiff, very plastic 28 30 WELL3 PROJECT: Morton Reading FI Log of Well No. LAW12-60 (cont'd) SAMPLES OVM Reading ≟PTH (feet) WELL CONSTRUCTION Sample DESCRIPTION Blows/ Foot NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. **DETAILS AND/OR** DRILLING REMARKS SANDY GRAVELLY CLAY (CH): continued 32 34 15 1/2" Auger hole (10 1/4" ID Augers) SANDY GRAVEL (GP): dark gray to reddish brown, 36 saturated, ~70% gravel (<2"), ~30% fine to coarse sand, loose SILTY CLAY (CL): reddish brown, becomes grayish brown below 39', damp, soft to very stiff, breaks in 8" Outer casing to 25'; 6" concoidal pattern locally, moderately plastic core hole to 40' as pilot hole; Reamed with 15" 38 OD 12 7/8" ID augers 40 0.0 42 CLAYEY SILT (ML): greenish gray, wet, ~80% silt, ~20% clay, compact, slightly plastic 4" Diameter Sch. 40 flush-threaded PVC riser with O-rings Very clayey with large cobbles 45'-47' 46 Cement/bentonite grout Locally iron staining 47'-52' 48 WELL3

Log of Well No. LAW12-60 (cont'd) SAMPLES OVM Reading WELL CONSTRUCTION Sample No. Sample Blows/ Foot DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, DETAILS AND/OR cementation, react. w/HCl, geo. inter. DRILLING REMARKS CLAYEY SILT (ML): continued 0.0 50 52 Bentonite chips SAND (SP): reddish brown, saturated to wet, fine to medium grained, loose 0.0 54 Same as above 56 15/30 Sand 58 4" Diameter wraparound stainless steel screen with 0.020" slots 60 62 64 0.5' Endcap WELL3 **Geomatrix Consultants** Project No. 7168 Page 4 of 5

Morton Reading FI

PROJECT:

PROJECT: Morton Reading FI	Log o	f Well No. LAW1	2-60 (cont'd)
Samples Sample South Sou	DESCRIPTION		WELL CONSTRUCTION
NAME (USCS): color, cementate	moist, % by wt., plast. density, struct ion, react. w/HCl, geo. inter.	ure,	DETAILS AND/OR DRILLING REMARKS
SAND (SP): contin	ued		
66			
Total Depth: 66 fee	et below ground surface		
68-			
70-		-	
		-	
-		-	
-		-	
72-		-	
		-	
· -			
74-			
'4			
76-			
-			
78-			
		-	
-		-	
80-		-	
		-	
		-	
82			WELL3
Geomatrix Consul	tants	Project No. 7168	Page 5 of 5

APPENDIX B

TARGET ANALYTE LISTS

TABLE OF CONTENTS APPENDIX B

Table B-1	Contract Laboratory Program (CLP) Target Analyte List
Table B-2	Appendix IX Target Analyte List
Table B-3	Geotechnical and General Water Quality Parameters
Table B-4	Target Analyte List Sediment and Seep Analysis
Table B-5	Background Soil Sampling Target Analyte List

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
Inorganic Constituents		
Aluminum	(Total)	6010B
Antimony	(Total)	6010 B
Arsenic	(Total)	6010 B
Barium	(Total)	6010B
Beryllium	(Total)	6010 B
Cadmium	(Total)	6010 B
Calcium	(Total)	6010B
Chromium	(Total)	6010B
Cobalt	(Total)	6010B
Copper	(Total)	6010 B
Cyanide	57-12-5	9012A
Iron	(Total)	6010B
Lead	(Total)	6010B
Magnesium	(Total)	6010B
Manganese	(Total)	6010 B
Mercury	(Total)	7471A/7470A
Nickel	(Total)	6010B
Potassium	(Total)	6010 B
Selenium	(Total)	6010B
Silver	(Total)	6010B
Sodium	(Total)	6010B
Sulfide	18496-25-8	376.1
Thallium	(Total)	6010B
Vanadium	(Total)	6010B
Zinc	(Total)	6010 B
Volatile Organic Constituents		
Acetone	67-64-1	8260B
Benzene	71-43-2	8260B
Bromochloromethane	74-97-5	8260B
Bromodichloromethane	75-27-4	8260B
Bromoform; Tribromomethane	75-25-2	8260B
Bromomethane; Methyl bromide	74-83-9	8260B
Carbon disulfide	75-15-0	8260B
Carbon tetrachloride	56-23-5	8260B
Chlorobenzene	108-90-7	8260B
Chloroethane; Ethyl chloride	75-00-3	8260B
Chloroform	67-66-3	8260B
Cyclohexane	110-82-7	8260B
Dibromochloromethane; Chlorodibromomethane	124-48-1	8260B
1,2-Dibromo-3-chloropropane; DBCP	96-12-8	8260B
1,2-Dibromoethane; Ethylene dibromide (EDB)	106-93-4	8260B
Dichlorodifluoromethane	75-71-8	8260B
1,1-Dichloroethane (1,1-DCA)	75-34-3	8260B
1,2-Dichloroethane; Ethylene dichloride	107-06-2	8260B
1,1-Dichloroethene; 1,1-Dichloroethylene; Vinylidene chloride	75-35-4	8260B

Morton International, Inc.
Reading, Ohio

	 	
Common name ¹	CAS RN ²	Analytical Method ³
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2	8260B
trans-1,2-Dichloroethene; trans-1,2-Dichloroethylene	156-60-5	8260B
1,2-Dichloropropane	78-87-5	8260B
cis-1,3-Dichloropropene	10061-01-5	8260B
trans-1,3-Dichloropropene	10061-02-6	8260B
Ethylbenzene	100-41-4	8260B
2-Hexanone	591-78-6	8260B
Isopropylbenzene; cumene	98-82-8	8260B
Methyl acetate	79-20-9	8260B
Methyl chloride; Chloromethane	74-87-3	8260B
Methyl cyclohexane	108-87-2	8260B
Methylene chloride; Dichloromethane	75-09-2	8260B
Methyl ethyl ketone; 2-Butanone; MEK	78-93-3	8260B
4-Methyl-2-pentanone; Methyl isobutyl ketone (MIBK)	108-10-1	8260B
Methyl tert-butyl ether	1634-04-4	8260B
Styrene	100-42-5	8260B
1,1,2,2-Tetrachloroethane	79-34-5	8260B
Tetrachloroethylene; Perchloroethylene; Tetrachlorethene (PCE)	127-18-4	8260B
Toluene	108-88-3	8260B
1,1,1-Trichloroethane; Methylchloroform	71-55-6	8260B
1,1,2-Trichloroethane	79-00-5	8260B
Trichloroethylene; Trichloroethene	79-01-6	8260B
Trichlorofluoromethane	75-69-4	8260B
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	8260B
Vinyl chloride	75-01-4	8260B
Xylene (total)	1330-20-7	8260B
Semivolatile Organic Constituents		
Acenaphthene	83-32-9	8270C
Acenaphthylene	208-96-8	8270C
Acetophenone	98-86-2	8270C
Anthracene	120-12-7	8270C
Atrazine	1912-24-9	8270C
Benzaldehyde	100-52-7	8270C
Benzo[a]anthracene; Benzanthracene	56-55-3	8270C
Benzo[b]fluoranthene	205-99-2	8270C
Benzo[k]fluoranthene	207-08-9	8270C
Benzo[ghi]perylene	191-24-2	8270C
Benzo[a]pyrene	50-32-8	8270C
1,1'-Biphenyl	92-52-4	8270C
Bis(2-chloroethoxy)methane	111-91-1	8270C
Bis(2-chloroethyl)ether	111-44-4	8270C
Bis(2-ethylhexyl) phthalate	117-81-7	8270C
4-Bromophenyl phenyl ether	101-55-3	8270C
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	8270C
iliputyi ociizyi piitilalate, Delizyi ottyi piitilalate		
Caprolactam	105-60-2	8270C

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
4-Chloroaniline; p-Chloroaniline	106-47-8	8270C
4-Chloro-3-methylphenol; p-Chloro-m-cresol	59-50-7	8270C
2-Chloronaphthalene	91-58-7	8270C
2-Chlorophenol	95-57-8	8270C
4-Chlorophenyl phenyl ether	7005-72-3	8270C
Chrysene	218-01-9	8270C
o-Cresol; 2-Methylphenol	95-48-7	8270C
p-Cresol; 4-Methylphenol	106-44-5	8270C
Dibenz[a,h]anthracene	53-70-3	8270C
Dibenzofuran	132-64-9	8270C
Di-n-butyl phthalate	84-74-2	8270C
1,2-Dichlorobenzene; o-Dichlorobenzene	95-50-1	8270C
1,3-Dichlorobenzene; m-Dichlorobenzene	541-73-1	8270C
1,4-Dichlorobenzene; p-Dichlorobenzene	106-46-7	8270C
3,3'-Dichlorobenzidine	91-94-1	8270C
2,4-Dichlorophenol	120-83-2	8270C
Diethyl phthalate	84-66-2	8270C
2,4-Dimethylphenol	105-67-9	8270C
Dimethyl phthalate	131-11-3	8270C
4,6-Dinitro-2-methylphenol; 4,6-Dinitro-o-cresol	534-52-1	8270C
2,4-Dinitrophenol	51-28-5	8270C
2,4-Dinitrotoluene	121-14-2	8270C
2,6-Dinitrotoluene	606-20-2	8270C
Di-n-octyl phthalate	117-84-0	8270C
Fluoranthene	206-44-0	8270C
Fluorene	86-73-7	8270C
Hexachlorobenzene	118-74-1	8270C
Hexachlorobutadiene	87-68-3	8270C
Hexachlorocyclopentadiene	77-47-4	8270C
Hexachloroethane	67-72-1	8270C
Indeno(1,2,3-cd)pyrene	193-39-5	8270C
Isophorone	78-59-1	8270C
2-Methylnaphthalene	91 - 57 - 6	8270C
Naphthalene	91-20-3	8270C
2-Nitroaniline; o-Nitroaniline	88-74-4	8270C
3-Nitroaniline; m-Nitroaniline	99-09-2	8270C
4-Nitroaniline; p-Nitroaniline	100-01-6	8270C
Nitrobenzene	98-95-3	8270C
2-Nitrophenol; o-Nitrophenol	88-75-5	8270C
4-Nitrophenol; p-Nitrophenol	100-02-7	8270C
N-Nitrosodiphenylamine	86-30-6	8270C
N-Nitrosodi-n-propylamine; N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7	8270C
2,2'-Oxybis(1-chloropropane)	108-60-1	8270C
Pentachlorophenol	87-86-5	8270C
Phenanthrene	85-01-8	8270C
Phenol	108-95-2	8270C

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
Pyrene	129-00-0	8270C
1,2,4-Trichlorobenzene	120-82-1	8270C
2,4,5-Trichlorophenol	95-95-4	8270C
2,4,6-Trichlorophenol	88-06-2	8270C
Polychlorinated Biphenyl Aroclors		
Aroclor 1016	12674-11-2	8082
Aroclor 1221	11104-28-2	8082
Aroclor 1232	11141-16-5	8082
Aroclor 1242	53469-21-9	8082
Aroclor 1248	12672-29-6	8082
Aroclor 1254	11097-69-1	8082
Aroclor 1260	11096-82-5	8082
Organochlorine Pesticides		
Aldrin	309-00-2	80 81 A
alpha-BHC	319-84-6	80 81A
beta-BHC	319-85-7	8081A
delta-BHC	319-86-8	8081A
gamma-BHC (Lindane)	58-89-9	8081A
alpha-Chlordane	5103-71-9	8081A
gamma-Chlordane	5103-74-2	8081A
4,4'-D DD	72-54-8	8081A
4,4'-DDE	72-55-9	8081A
4,4'-DDT	50-29-3	80 81 A
Dieldrin	60-57-1	8081A
Endosulfan I	959-98-8	8081A
Endosulfan II	33213-65-9	8081A
Endosulfan sulfate	1031-07-8	8081A
Endrin	72-20-8	8081A
Endrin aldehyde	7421-93-4	8081A
Endrin ketone	53494-70-5	8081A
Heptachlor	76-44-8	8081A
Heptachlor epoxide	1024-57-3	8081A
Methoxychlor	72-43-5	8081A
Toxaphene	8001-35-2	8081A

Notes:

- 1 Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.
- 2 Chemical Abstracts Service registry number (CAS RN). Where "Total" is entered, all species that contain this element are included.
- 3 Analytical methods refer to analytical procedure numbers used in the U.S. Environmental Protection Agency (USEPA) publication, SW-846, "Test Methods for Evaluating Solid Waste," Current Edition.

Contract Laboratory Program Target Analyte List developed from the USEPA Superfund Contract Laboratory Program.

Available from Internet url: http://www.epa.gov/superfund/programs/clp/target.htm

Morton International, Inc.
Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
Inorganic Constituents		(010)
Antimony	(Total)	6010B
Arsenic	(Total)	6010 B
Barium	(Total)	6010 B
Beryllium	(Total)	6010B
Cadmium	(Total)	6010 B
Chromium	(Total)	6010B
Cobalt	(Total)	6010 B
Copper	(Total)	6010 B
Cyanide	57-12-5	9012A
ead	(Total)	6010 B
Mercury	(Total)	7471A/7470A
lickel	(Total)	6010 B
elenium	(Total)	6010 B
ilver	(Total)	6010 B
sulfide	18496-25-8	376.1
Challium	(Total)	6010 B
/anadium	(Total)	6010 B
Zinc	(Total)	6010 B
Volatile Organic Constituents		
Acetone	67-64-1	8260B
Acetonitrile; Methyl cyanide	75-05-8	8260B
Acrolein	107-02-8	8260B
Acrylonitrile	107-13-1	8260B
Benzene	71-43-2	8260B
Bromodichloromethane	75-27-4	8260B
Bromoform; Tribromomethane	75-25-2	8260B
Bromomethane; Methyl bromide	74-83-9	8260B
Carbon disulfide	75-15-0	8260B
Carbon tetrachloride	56-23-5	8260B
Chlorobenzene	108-90-7	8260B
Chloroethane; Ethyl chloride	75-00-3	8260B
Chloroform	67-66-3	8260B
Chloroprene	126-99-8	8260B
3-Chloropropene; 3-Chloro-1-propene; Allyl chloride	107-05-1	8260B
Dibromochloromethane; Chlorodibromomethane	124-48-1	8260B
,2-Dibromo-3-chloropropane; DBCP	96-12-8	8260B
,2-Dibromoethane; Ethylene dibromide (EDB)	106-93-4	8260B
Dibromomethane; Methylene bromide	74-95-3	8260B
rans-1,4-Dichloro-2-butene	110-57-6	8260B
Dichlorodifluoromethane	75-71-8	8260B
,1-Dichloroethane (1,1-DCA)	75-34-3	8260B
,2-Dichloroethane; Ethylene dichloride	107-06-2	8260B
,1-Dichloroethene; 1,1-Dichloroethylene; Vinylidene chloride	75-35-4	8260B
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2	8260B
rans-1,2-Dichloroethene; trans-1,2-Dichloroethylene	156-60-5	8260B
,2-Dichloropropane	78-87-5	8260B
cis-1,3-Dichloropropene	10061-01-5	8260B
rans-1,3-Dichloropropene	10061-02-6	8260B
Ethylbenzene	100-41-4	8260B
Ethyl methacrylate	97-63-2	8260B

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
2-Hexanone	591-78-6	8260B
sobutyl alcohol	78-83-1	8260B
Methacrylonitrile	126-98-7	8260B
Methyl chloride; Chloromethane	74-87-3	8260B
Methylene chloride; Dichloromethane	75-09-2	8260B
Methyl ethyl ketone; 2-Butanone; MEK	78-93-3	8260B
Methyl iodide; Iodomethane	74-88-4	8260B
Methyl methacrylate	80-62-6	8260B
1-Methyl-2-pentanone; Methyl isobutyl ketone (MIBK)	108-10-1	8260B
Propionitrile; Ethyl cyanide	107-12-0	8260B
Styrene	100-42-5	8260B
1,1,1,2-Tetrachloroethane	630-20-6	8260B
Tetrachloroethylene; Perchloroethylene; Tetrachlorethene (PCE)	127-18-4	8260B
Toluene	108-88-3	8260B
1,1,1-Trichloroethane; Methylchloroform	71-55-6	8260B
1,1,2-Trichloroethane	79-00-5	8260B
Frichloroethylene; Trichloroethene	79-01-6	8260B
Trichlorofluoromethane	75-69-4	8260B
1,2,3-Trichloropropane	96-18-4	8260B
Vinyl acetate	108-05-4	8260B
Vinyl chloride	75-01-4	8260B
Xylene (total)	1330-20-7	8260B
Acenaphthene Acenaphthylene	83-32-9 208-96-8	8270C 8270C
Acetophenone	98-86-2	8270C
2-Acetylaminofluorene; 2-AAF	53-96-3	8270C
4-Aminobiphenyl	92-67-1	8270C
Aniline	62-53-3	8270C
Anthracene	120-12-7	8270C
Aramite	140-57-8	8270C
Benzo[a]anthracene; Benzanthracene	56-55-3	8270C
Benzo[b]fluoranthene	205-99-2	8270C
Benzo[k]fluoranthene	207-08-9	8270C
Benzo[ghi]perylene	191-24-2	8270C
Benzo[a]pyrene	50-32-8	8270C
Benzyl alcohol	100-51-6	8270C
Bis(2-chloroethoxy)methane	111-91-1	8270C
Bis(2-chloroethyl)ether	111-44-4	8270C
Bis(2-chloro-1-methylethyl) ether; 2,2-Di-chlorodiisopropyl ether	108-60-1	8270C
Bis(2-ethylhexyl) phthalate	117-81-7	8270C
4-Bromophenyl phenyl ether	101-55-3	8270C
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	8270C
4-Chloroaniline; p-Chloroaniline	106-47-8	8270C
Chlorobenzilate	510-15-6	8270C
4-Chloro-3-methylphenol; p-Chloro-m-cresol	59-50-7	8270C
4-Cinoro-3-incuryrphenor, p-Cinoro-in-cresor		8270C
	91-58-7	
2-Chloronaphthalene 2-Chlorophenol	91-58-7	8270C
2-Chloronaphthalene 2-Chlorophenol	95-57-8	
2-Chloronaphthalene		8270C 8270C 8270C

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
o-Cresol; 2-Methylphenol	95-48-7	8270C
p-Cresol; 4-Methylphenol	106-44-5	8270C
Dibenz[a,h]anthracene	53-70-3	8270C
Dibenzofuran	132-64-9	8270C
Di-n-butyl phthalate	84-74-2	8270C
1,2-Dichlorobenzene; o-Dichlorobenzene	95-50-1	8270C
1,3-Dichlorobenzene; m-Dichlorobenzene	541-73-1	8270C
1,4-Dichlorobenzene; p-Dichlorobenzene	106-46-7	8270C
3,3'-Dichlorobenzidine	91-94-1	8270C
2,4-Dichlorophenol	120-83-2	8270C
2,6-Dichlorophenol	87-65-0	8270C
Diethyl phthalate	84-66-2	8270C
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	8270C
Dimethoate	60-51-5	8270C 8270C
p-(Dimethylamino)azobenzene	60-51-5	8270C 8270C
p-(Dimethylamino)azobenzene 7,12-Dimethylbenz[a]anthracene	57-97-6	8270C 8270C
3,3-Dimethylbenzidine	119-93-7	8270C 8270C
alpha, alpha-Dimethylphenethylamine	119-93-7	8270C 8270C
2,4-Dimethylphenol	105-67-9	8270C 8270C
	131-11-3	8270C 8270C
Dimethyl phthalate		
1,2-Dinitrobenzene; o-Dinitrobenzene	528-29-0	8270C
m-Dinitrobenzene; 1,3-Dinitrobenzene	99-65-0	8270C
4,6-Dinitro-2-methylphenol; 4,6-Dinitro-o-cresol	534-52-1	8270C
2,4-Dinitrophenol	51-28-5	8270C
2,4-Dinitrotoluene	121-14-2	8270C
2,6-Dinitrotoluene	606-20-2	8270C
Di-n-octyl phthalate	117-84-0	8270C
1,4-Dioxane	123-91-1	8270C
Diphenylamine	122-39-4	8270C
Disulfoton	298-04-4	8270C
Ethyl methanesulfonate	62-50-0	8270C
Famphur	52-85-7	8270C
Fluoranthene	206-44-0	8270C
Fluorene	86-73-7	8270C
Hexachlorobenzene	118-74-1	8270C
Hexachlorobutadiene	87-68-3	8270C
Hexachlorocyclopentadiene	77-47-4	8270C
Hexachloroethane	67-72-1	8270C
Hexachloropropene	1888-71-7	8270C
Indeno(1,2,3-cd)pyrene	193-39-5	8270C
Isophorone	78-59-1	8270C
Isosafrole	120-58-1	8270C
Methapyrilene	91-80-5	8270C
3-Methylcholanthrene	56-49-5	8270C
Methyl methanesulfonate	66-27-3	8270C
2-Methylnaphthalene	91-57-6	8270C
Naphthalene	91-20-3	8270C
1,4-Naphthoquinone	130-15-4	8270C
1-Naphthylamine	134-32-7	8270C
2-Naphthylamine	91-59-8	8270C
2-Nitroaniline; o-Nitroaniline	88-74-4	8270C

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical
		Method ³
3-Nitroaniline; m-Nitroaniline	99-09-2	8270C
4-Nitroaniline; p-Nitroaniline	100-01 - 6	8270C
Nitrobenzene	98-95-3	8270C
2-Nitrophenol; o-Nitrophenol	88-75-5	8270C
4-Nitrophenol; p-Nitrophenol	100-02-7	8270C
4-Nitroquinoline 1-oxide	56-57-5	8270C
N-Nitrosodi-n-butylamine	924-16-3	8270C
N-Nitrosodiethylamine	55-18-5	8270C
N-Nitrosodimethylamine	62-75-9	8270C
N-Nitrosodiphenylamine	86-30-6	8270C
N-Nitrosodi-n-propylamine; N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7	8270C
N-Nitrosomethylethylamine	10595-95-6	8270C
N-Nitrosomorpholine	59-89-2	8270C
N-Nitrosopiperidine	100-75-4	8270C
N-Nitrosopyrrolidine	930-55-2	8270C
5-Nitro-o-toluidine	99-55-8	8270C
Pentachlorobenzene	608-93-5	8270C
Pentachloronitrobenzene	82-68-8	8270C
Pentachlorophenol	87-86-5	8270C
Phenacetin	62-44-2	8270C
Phenanthrene	85-01-8	8270C
Phenol	108-95-2	8270C
p-Phenylenediamine	106-50-3	8270C
Phorate	298-02-2	8270C
2-Picoline	109-06-8	8270C
Pronamide	23950-58-5	8270C
Pyrene	129-00-0	8270C
Pyridine	110-86-1	8270C
Safrole	94-59-7	8270C
Sulfotepp; Tetraethyl dithiopyrophosphate	3689-24-5	8270C
1,2,4,5-Tetrachlorobenzene	95-94-3	8270C
2,3,4,6-Tetrachlorophenol	58-90-2	8270C
o-Toluidine	95-53-4	8270C
1,2,4-Trichlorobenzene	120-82-1	8270C
2,4,5-Trichlorophenol	95-95-4	8270C
2,4,6-Trichlorophenol	88-06-2	8270C
O,O,O-Triethyl phosphorothioate	126-68-1	8270C
1,3,5-Trinitrobenzene; sym-Trinitrobenzene	99-35-4	8270C
Polychlorinated Biphenyl Aroclors		
Aroclor 1016	12674-11-2	8082
Aroclor 1221	11104-28-2	8082
Aroclor 1232	11141-16-5	8082
Aroclor 1242	53469-21-9	8082
Aroclor 1248	12672-29-6	8082
Aroclor 1254	11097-69-1	8082
Aroclor 1260	11096-82-5	8082
Organochlorine Pesticides		
Aldrin	309-00-2	8081A
alpha-BHC	319-84-6	8081A
beta-BHC	319-85-7	8081A
pola Dire	1 21,7-03-1	0001A

Morton International, Inc. Reading, Ohio

Common name ¹	CAS RN ²	Analytical Method ³
PHO (I : 1)	50.00.0	
gamma-BHC (Lindane) Chlordane	58-89-9 57-74-9	8081A
Chlorobenzilate		8081A
	510-15-6	8081A
4,4'-DDD	72-54-8	8081A
4,4'-DDE	72-55-9	8081A
4,4'-DDT	50-29-3	8081A
Diallate	2303-16-4	8081A
Dieldrin	60-57-1	8081A
Endosulfan I	959-98-8	8081A
Endosulfan II	33213-65-9	8081A
Endosulfan sulfate	1031-07-8	8081A
Endrin	72-20-8	8081A
Endrin aldehyde	7421-93-4	8081A
Heptachlor	76-44-8	8081A
Heptachlor epoxide	1024-57-3	8081A
Isodrin	465-73-6	8081A
Kepone	143-50-0	8081A
Methoxychlor	72-43-5	8081A
Toxaphene	8001-35-2	8081A
Dioxins/Furans		
Total Hexachlorodibenzo-p-dioxin; HxCDD	34465-46-8	8280A
Total Hexachlorodibenzofuran; HxCDF	55684-94-1	8280A
Total Pentachlorodibenzo-p-dioxin; PeCDD	36088-22-9	8280A
Total Pentachlorodibenzofuran; PeCDF	30402-15-4	8280A
2,3,7,8-Tetrachlorodibenzo-p-dioxin; TCDD	1746-01-6	8280A
Total Tetrachlorodibenzo-p-dioxin; TCDD	41903-57-5	8280A
Total Tetrachlorodibenzofuran; TCDF	55722-27-5	8280A

Notes:

- 1 Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.
- 2 Chemical Abstracts Service registry number (CAS RN). Where "Total" is entered, all species that contain this element are included.
- 3 Analytical methods refer to analytical procedure numbers used in the U.S. Environmental Protection Agency (USEPA) publication, SW-846, "Test Methods for Evaluating Solid Waste," Current Edition.

Appendix IX Target Analyte List developed from Title 40 of the Code of Federal Regulations, Part 264, Appendix IX.

TABLE B-3 GEOTECHNICAL AND GENERAL WATER QUALITY PARAMETERS

Morton International, Inc.
Reading, Ohio

PARAMETER	METHOD REFERENCE
GEOTECHNICAL	
Atterberg Limits	ASTM D4318
Moisture content	ASTM D2216
Cation Exchange Capcity (CEC)	SW-846 9081
pH	ASTM D2976
Grain size distribution (Sieve Analysis)	ASTM D421, 422
Total Organic Carbon (TOC)	Walkley Black
GENERAL WATER QUALITY	
Total Suspended Solids (TSS)	40 CFR Part 136 160.2
Alkalinity/Bi-carbonate/Carbonate	40 CFR Part 136 310.1
Ammonia-Nitrogen (NH ₃)	40 CFR Part 136 350.1
Nitrate/Nitrite (NO ₃ -/ NO ₂)	40 CFR Part 136 353.2
Phosphate (PO ₄ -3)	40 CFR Part 136 365.2
Phosphorous	40 CFR Part 136 365.2
Total Dissolved Solids (TDS)	40 CFR Part 136 160.1
Calcium (total and dissolved)	SW-846 6010B
Chloride	40 CFR Part 325.3 or 300.0
Ferric Iron (Fe ⁺²)	SM SW-846 3500 FE-D
Ferrous Iron (Fe ⁺³)	SM SW-846 3500 D
Iron (total and dissolved)	SW-846 6010B
Magnesium (total and dissolved)	SW-846 6010B
Potassium (total and dissolved)	SW-846 6010B
Sodium (total and dissolved)	SW-846 6010B
Total Organic Carbon (TOC)	40 CFR Part 136 415.1 / ASTM D2974

Notes:

ASTM = American Society of Testing and Materials.

 $CFR = Code \ of \ Federal \ Regulations.$

Analytical methods refer to analytical procedure numbers used in the U.S. Environmental Protection Agency (USEPA) publication, SW-846, "Test Methods for Evaluating Solid Waste," Current Edition.

Table B-4 Target Analyte List Sediment and Seep Analysis

Morton International, Inc.
Reading, Ohio

1,1-Dichloroethane	Endrin
1,2-Dichloroethane	Endrin aldehyde
Acetone	Endrin ketone
Benzene	Heptachlor
Bromodichloromethane	Heptachlor epoxide
Carbon disulfide	Isodrin
Chlorobenzene	Aluminum
Chloroform	Antimony
Chloroethane	Arsenic
Dichlorodifluoromethane	Barium
Ethylbenzene	Beryllium
Methylcyclohexane	Cadmium
Methylene chloride	Calcium
Toluene	Chromium
Xylenes (total)	Cobalt
1,2-Dichlorobenzene	Copper
1,4-Dichlorobenzene	Cyanide, Total
2-Methylphenol	Iron
4-Methylphenol	Lead
Aniline	Magnesium
Benzaldehyde	Manganese
Aldrin	Mercury
alpha-Chlordane	Nickel
alpha-BHC	Potassium
beta-BHC	Selenium
delta-BHC	Sodium
4,4'-DDD	Sulfide
4,4'-DDE	Thallium
4,4'-DDT	Tin
Dieldrin	Vanadium
Endosulfan I	Zinc
Endosulfan II	

Table B-5

Background Soil Sampling Target Analyte List

Morton International, Inc.

Reading, Ohio

1,1,1-Trichloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethene 1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene 1,2-Dichloroethene 1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene 1,2-Dichloroethene Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Aroclor 1016 Aroclor 1242 Aroclor 1260 Organochlorine Pesticides Aldrin alpha-Chlordane alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor Metals		
1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethene 1,2-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylcyclohexane Methylene chloride Tetrachloroethene	Aroclor 1260 Organochlorine Pesticides Aldrin alpha-Chlordane alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
1,1-Dichloroethane 1,1-Dichloroethene 1,2-Dichloroethane cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Aldrin alpha-Chlordane alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan II Endrin aldehyde Endrin ketone Heptachlor Heptachlor Bethordane Aldrin Methoxychlor		
1,1-Dichloroethene 1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Aldrin alpha-Chlordane alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor Isodrin Methoxychlor		
1,2-Dichloroethane cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylcyclohexane Methylene chloride Tetrachloroethene	alpha-Chlordane alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor Isodrin Methoxychlor		
cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylcyclohexane Methylene chloride Tetrachloroethene	alpha-BHC beta-BHC delta-BHC 4,4'-DDD 4,4'-DDT Dieldrin Endosulfan I Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor Beta-BHC 4,4'-DDT Dieldrin Endosulfan II Endosulfan II Endrin Endrin Endrin Endrin		
trans-1,2-Dichloroethene 1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	beta-BHC delta-BHC 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
1,2-Dichloroethene (total) Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylcyclohexane Methylene chloride Tetrachloroethene	delta-BHC 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Acetone Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Benzene Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Bromodichloromethane Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Bromoform 2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Dieldrin Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
2-Butanone Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylcyclohexane Methylene chloride Tetrachloroethene	Endosulfan I Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Carbon disulfide Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Endosulfan II Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Chlorobenzene Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Endrin Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Chloroform Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Cyclohexane Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Endrin ketone Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Dibromochloromethane Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Heptachlor Heptachlor epoxide Isodrin Methoxychlor		
Dichlorodifluoromethane Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Heptachlor epoxide Isodrin Methoxychlor		
Ethylbenzene Methylcyclohexane Methylene chloride Tetrachloroethene	Isodrin Methoxychlor		
Methylcyclohexane Methylene chloride Tetrachloroethene	Methoxychlor		
Methylene chloride Tetrachloroethene			
Tetrachloroethene			
	Aluminum		
Toluene	Antimony		
Trichloroethene	Arsenic		
Vinyl chloride	Barium		
Xylenes (total)	Beryllium		
emivolatile Organic Compounds	Cadmium		
1,2-Dichlorobenzene	Calcium		
1.3-Dichlorobenzene	Chromium		
1,4-Dichlorobenzene	Cobalt		
2-Methylphenol	Copper		
4-Methylphenol Aniline	Cyanide, Total		
	Iron		
Benzaldehyde	Lead		
bis(2-Ethylhexyl) phthalate	Magnesium		
Benzo(a)anthracene	Manganese		
Benzo(a)pyrene	Mercury		
Benzo(b)fluoranthene	Nickel		
Benzo(ghi)perylene	Potassium		
Benzo(k)fluoranthene	Selenium		
Carbazole	Silver		
Chrysene	Sodium		
Dibenz(a,h)anthracene	Sulfide		
Dibenzofuran	Thallium		
Fluoranthene	Tin		
Fluorene	Vanadium		
Indeno(1,2,3-cd)pyrene	Zinc		
Phenanthrene			

APPENDIX C

AQUIFER TEST RESULTS

TABLE OF CONTENTS APPENDIX C

Table C-1 Summary of Step-Test ResultsTable C-2 Calculated Flow Velocities in Groundwater

Supporting Documentation

- Aquifer Tests Purpose and Methods
- Calculation Sheets Specific Capacity for Each Step
- Calculation Sheets Saturated Thickness and Aquifer Type and Penetration
- Calculation Sheets Select/Determine Correct Specific Capacity and Calculate T and K
- Calculation Sheets Effects of Pumping Step Tests on Aquifers above and below Test Zone
- Calculation Sheets Estimated Groundwater Flow Rate
- Calculation Sheets Calculate T from Semilog Plot

Table C-1 Summary of Step-Test Results

Morton International, Inc.
Reading, OH

Pumped Well	Vertical Response Observation Well	Flow Rate Steps (gpm)	Maximum Drawdown (ft)	Specific Capacity (gpm/ft)	Estimated Transmissivity (gal/day-ft)	Saturated Thickness (ft) Confined or Unconfined Percent Penetrated	Estimated Hydraulic Conductivity (ft/day)	Response Observed In Observation Well?
UAW02-20	UAW02-40	2.0	0.49	4.08	5000	6.3	106	no
		5.0	1.36	3.68		unconfined		
		9.5	3.01	3.16		100%		
UAW02-40	UAW02-20	3.0	0.22	13.64	46500	19.6	317	no
		6.0	0.24	25.00		confined		
		7.5	0.26	28.85		72%		
		9.5	0.4	23.75				
UAW20-60	EPA-2	2.0	6.76	0.30	280	21.7	1.7	no
		2.5	14.18	0.18		unconfined		
		3.0	20.95	0.14		52%		

Table C-2 Calculated Flow Velocities of Groundwater

Morton International, Inc. Reading, Ohio

Test Well	Zone of Upper Aquifer	Estimate Hydraulic Conductivity (ft/day)	Effective Porosity (dimensionless)	Hydraulic Gradient (ft/ft)	Horizontal Flow Rate (ft/day)
UAW02-20	20-foot	106	25%	0.019	8.1
UAW02-40	40-foot	317	25%	0.0019	2.4
UAW20-60	60-foot	1.7	25%	0.0019	0.013

Subjec	Aquifer Tests – Rohm	& Haas – Rea	ding, OI	-	Project No.	7168A
Ву	MB	Checked By	RDC	RX	Task No.	Aquifer Test
					File No.	1
Date	3/12/02	Da te	5-3-02		Sheet	1 of 1

Purpose:

- Measure properties of aquifer materials.
- Determine effect of pumping on water levels in underlying/overlying aquifers.
- Estimate groundwater flow rates.

Data:

• Pumping step tests of selected wells, December 5-7, 2001.

Method:

- Calculate specific capacity of wells at each step. (File 2)
- Determine saturated thickness of aquifer, confined/unconfined character, and fraction penetrated by test well. (File 3)
- Estimate transmissivity (T) and hydraulic conductivity (K) from specific capacity and saturated thickness. (File 4)
- Examine data from observation wells for evidence of effects of pumping underlying/overlying aquifer. (File 5)
- Estimate groundwater velocity. (File 6)
- Estimate T from recovery-period data, if sufficient data available. (File 7)

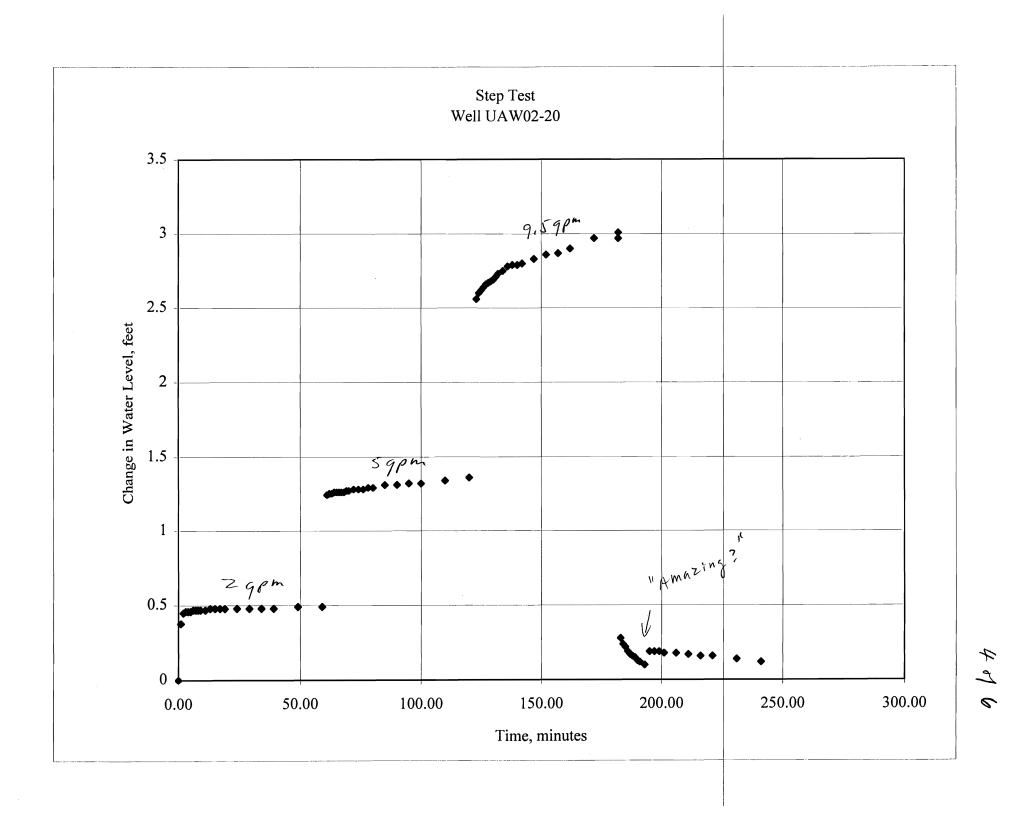
Caveats:

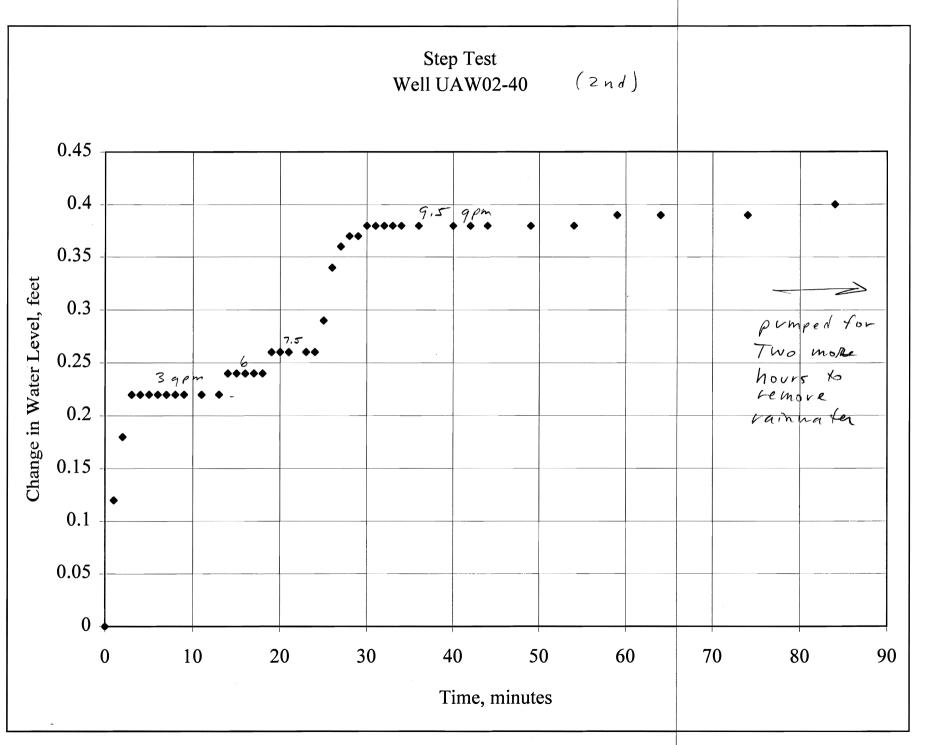
- Additional drawdown due to well inefficiency/skin effect will reduce measured sp. cap and underestimate T.
- Partial penetration will cause additional drawdown, reduce measured sp. cap and underestimate T.

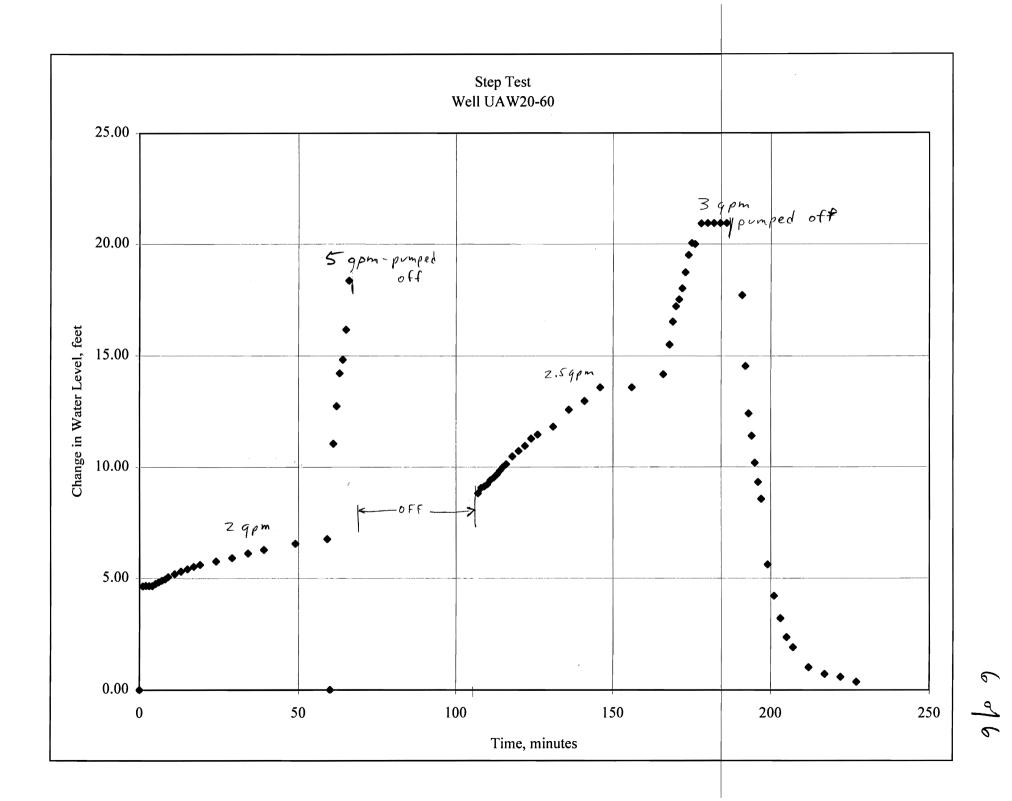
Subject_	Specifiz	Capacity Fo	r Each Step	Project No7	169
Ву	MEB	Checked By		Task No. Ag 🕥 File No. 🕏	for test
Date	3/7/02	Date 5-3	- OZ	Sheet	
4	Nethod:	use I raw and flow ro	down at evite for step		step
province on a situation of the constraints of the c	The second secon		Sp. Cap.		
e the table of the control of the co	wen v	AW 02-20	Stept.	est of Dec 5	2001
	entalentici en esta estrator per de disco con constitui en esta esta esta esta esta esta esta esta	Cap = F10	u Rate of we	de manifesta de la confessión de la conf	
	- (8	draw down		
di essere e	· · · · · · · · · · · · · · · · · · ·	se final draw	down at the	t associated i	and the same and t
7	lst Step.:	Flourate =		tend of per	104
	sperif:	e capacity at		Step=	
TO compared to		$Cap.(1) = \frac{2}{0.9}$			
	Znd Step	Flow Rate Drawdown	= 5.0 grm = 1.36 f+		
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	S P.	$c_{\eta}\rho\left(z\right)=\frac{5}{1.3}$	- 	gpm/f+	
	3r9 2+	Flow Rate	= 9.5 gpm		
		Draudonn	= 3,01		
. ~		Sp.cap.(3) = 3	7.5 .01 = 3,16	9pm/f+	
ege , se ged es .	and the second of the second o	engalaring at the second of		and the second of the second o	e u gaden este e e escribe

SubjectBy MS\$	Specific Ca From Step Checked By	pa ci ties Tests CX	Project No Task No File No.	
Date 3/7/62	Date 5-3-	٥٥	Sheet2	of
The second of th	Capacity 1	1AW 02-41 + of Dec.		o e e e e e e e e e e e e e e e e e e e
	Prano	oun = 0,227	F+	
	5p Cq	$\rho(1) = \frac{3}{0.22}$	= 13,64 91	om/f+
2nd	5 tep = F10.	n Rute = 6 gp	m .	and the second s
	Dran	down = 0,24	and the second s	
		$(ap(2) = \frac{6}{0.2y} =$		######################################
3 - 9		in Rale = 7.5		
resembles of the control of the cont	ba	ndown = 0.2	Control of the Contro	n maganikan sa mengilangan di kalangan ang mengalangan Pengapagan pangangan pangangan pangan pangangan pangangan pangangan pangangan pangangan pangangan pangangan pa
	Sp. c	$ap(3) = \frac{7.5}{0.36}$	28,85	gpalt+
A contract of the contract of	th step F1	on raxe = 9	5 9pn	militarian in a seri, enterapolitaria esperimonya e in
	Dr	awdown = 6.	4 ft	venimina (m. 1900). Program
		$Cap.(4) = \frac{9.5}{0.4}$	= 23.7	s gpm/f+
entraggerities in men te grate magnitude (1. graterities et al. sent	and the second of the second o			The second secon

Ву	mas	•	ies From Step IBy RDC	Task No	7/69
Jy	, ,			File No	
Date	3/7/02	Date	5-3-02	Sheet3_	of <u>b</u>
		The state of the s	and the second s		
	Specific C	apaci	H VAWZO	-60	
			Test of Dec.		en e
				* 1/20 10 00 00 10 00 00 00 00 00 00 00 00 00	
	t				
e i i i i i i i i i i i i i i i i i i i	1st Ste	ρ : F	low Rate = 2	gpm	
0 M. P	e e como son e e e e e e e e e e e e e e e e e e e		Orandown = 6	76	
and a subjective of table figures 2000 or full	e kongenera ng ngagang menang pangkan ng talang a banggang lawil gan gana na				anday jaran Tamera an an ang pagabahan na sa sa na na
was		1	Sp. Cap (1) = 6		er market ja sa saja karabahar ke sa sa sa sa sa
ara 20 m m m	<u> </u>			The second secon	Silver Si
		Mary and a second second	Sp. Cap. (1) = 0	,3 gpm/f4	e grande and antique graph and the first state and a consequence of a first state and a first state an
n i von egennen inti-	Free Control Minimproprieta (Control Minimproprieta (C	the complete after the control of the state	of the office of the section of the	and the second of the second s	and the second section was readingly about the condition of the second second section of the second
mennen gi en Norto i en en energia.	2nd S	tep:	Flow Rate =	2.59pm	en e
an in the second	e sametrico de la compansa de la co La compansa de la compansa del la compansa de	A W. L. DANNEL CO. CO. CO. C.	Drawdown =	and the company of the property of the company of t	The subsequence of the properties of the subsequence of the subsequenc
manage of the UNIT on the same of	The second of th		and the second s	and the second of the second o	
ar on the second of the	 Interpreted to the second secon	ter er two species who should	Sp. cap(2) =	14.18	gen in die strongen verden der Berkende der Stellen und der St
and the second of the second o			and the same of th		e i ne je poseni žvi i našani niesta sa n di poseni naje seprese membro sa naje je sa
ana a sa		AND THE RESERVE OF THE SECOND	Sp. Cap. (2) =	0,176 gpm/	'f+
#1401 - 744 - Y-Y-Y-Y-Y-Y-14-14-14-14-14-14-14-14-14-14-14-14-14-	No. 10 Control of the		A CONTRACTOR OF THE CONTRACTOR		A COLLEGE MENT AND THE COLLEGE
war i waliye apo esse, tas osse	3 rd S	ter.	Flow Rake =	3,0 9pm	n mengering bestämmer steller in dieser von die geben der
and a set of Manda and the second			e magazinare de la companio de la c	The second secon	er ann a fan de grant an
er ar in a partie of the			Draudoun =	20.95	A Service of the serv
a i a a a a a a a a a a a a a a a a a a	and the second of the second o	a de la companya del companya del companya de la co	Sp. Cap(3) =		and the second s
			Spire of the second	20.95	ethini ya maza wa masa isa
2 mm			Sp. Cap. (3) =		and the second section of the section of the second section of the section of the second section of the
			sρ. caρ. (3) =	0.143	
hushir na aku sayayeensade	s - www withough how shoes in the control of WWW. The	and an expect of a second of	and the second s	and the second of the second o	
					and the second of the second o
	and the transfer of the second				
race the news	is which make an warm of the control	· · · · · · · · · · · · · · · · · · ·		The state of the s	and the state of t
e company		, 1			
	CONTRACTOR OF THE CONTRACTOR O				







Subject	t Saturated 7	hickness and A.	suifer Type	Project No	7/69	
Зу	maB	hickness and A mation Checked By	DC	Task No File No	1qv:fer	Test
		Date 5.			/ of	<i>[[</i>
			A gray		and the second second	
\$	ATURATED	THICENESS			and the second of the second o	
						a a maja
	Screen P	02-20 osition =	8 to 18	ft BG	L Cloga	Hache
		of sand	7 Ft 186	c (Log of	F STRO7	
	Bit4	on of Sand	18ft BG	1,7 to 14.	7 F7	RTOL
		of sand on of sand r - ranged (ins	ide Scree	n)	a kanala da sa	
		· Fully Pen			e de la companya de	
		· Un confi	. •			The second second
and and any or other section			V		Language of the second control of the second control of the second control of the second control of the second	en og en
	Saturat	-cd Thickers =	Depth to B.	ottom of San	d - Static	vater C
			18 - 11.7			
	and the second of the second o		6.3 f+		The second of th	n in or covering
					and the second s	
	Well	VAW 02-40			e e e e e e e e e e e e e e e e e e e	
	Scu	een Position 7	3/,5-	46,5 ft	The second secon	Congression of the Congression o
		Top Sand =	26 ft	B64		
		Bottom Sahd				
		1301707		392	Andrew Commence of the Commenc	The second secon
		DTW Range				
	and the second s	Pehetration:	45.6 - 31.5 45.6 - 36	$=\frac{14.1}{19.6}$	0,72	
		Conclusion	,		,	a second of the
		· W	ell Penetra	ites 72	% of the	Sand
		. Ce	nfined Ag	vifer		
		Saturated	Thickness:			
			= 45.	6 - 26		
						and the second
		·	= 19.	6 ft		
			-			

Зу		Checked By	RDC	Task No File No	
Date	3/12/02	Date	5-3-02	Sheet	_of <i>[[</i>
	Well VAL				
in the second of MARY	and the same of th	and the constraint with the constraint of the co	ها با	- 61.5 Ft B	i Golden state en and service en
			34 F+ Bg 60 F+ BG		
es y new for elementary of 1955	reaction of the programme of the state of th	and he will be the state of the	29 370 C	and the contraction of the second section of the second second second second second second second second second	t dan arang merindak dan kemerang perjanjan d
	P. C. 1	etration =	60-465	26 = 5	2 %
and the second second	water	Level is	helow top	of SARD (Nath	tural Level
vicinia in a vicin					
		· Ag	vifer Unci	ontmed (at	time ofter
		· Ag	vifer Unci llis Partia		time oftes
		· Ag	vifer Unci llis Partia	illy penetrati	time oftes
		· Ag	vifer Unci llis Partia	illy penetrati	time oftes
		· Ag	vifer Unci llis Partia	illy penetrati	time oftes
		· Ag	vifer Unci llis Partia	illy penetrati	time oftes
		we was the contract of the con	vifer Unci llis Partia	illy penetrati	time ofter
		we was the contract of the con	vifer Un co	illy penetrati	time ofter

MORRE	N READING	Log	Log of Well No.		
BORING LOCATION:	81 SOUNT WANDE SIRE	ELEVATION AND DA	ELEVATION AND DATUM: WAY 2- (8'S"		
DRILLING CONTRACT	OR: BOWSIER MOIZNER	DATE STARTED:		DATE FINISHED:	
DRILLING METHOD:	ROTASONIC	TOTAL DEPTH:, (SCREEN INTERVAL	
DRILLING EQUIPMENT	4 0	DEPTH TO FIRST WATER:	COMPL	CASING:	
SAMPLING METHOD:	10' SAMPLE BANKEL/PLASTE		MANS	EU.	
HAMMER WEIGHT:	NA DROP: NA	RESPONSIBLE PRO	FESSIONAL:	REG. N	
_ SAMPLES		MATA	Mana		
DEPTH (feet) Sample No. Sample Foot	DESCRIPTION NAME (USCS Symbol): color, molet, % by w consistency, structure, cementation, react. with			NSTRUCTION DETAILS DRILLING REMARKS	
OEF (fa No. No. Blows Foot	Surface Elevation:				
 			111		
2-	SEE HAW 02 STROT		//7	CEMENT	
3	3/4/			BENTURINE 6	
4				43,9	
			000	BENTONINE	
ē -			60 es	5.9'bas	
7	·			LEN	
8-				A'OIAMETE	
9-				FLUSH THREADIZE	
,0-				- 1	
$\begin{vmatrix} i \\ ii \end{vmatrix} = \begin{vmatrix} i \\ i \end{vmatrix}$					
12 -		. []		. '	
13 -		· _		CONTINUOUS LA	
14 -	月.			STANKESS STA	
15-	ze suter			. ===1.3	
	STANING		$ \equiv \cdot\cdot\cdot$	# 6 Gevisa FILTER PA	
17-	OS TILL AT 17'		<u> </u>	SAND	
18-		_	# -	18	
19-		· -	00000	BENEN.TE	
''		,	·	*/*	
1					
] [· [,		
		[]			
]	ľ	. 1-]		
1	20 mp. b. of sond : THH III =	-	1		
1	3	1-	1		
	1 30 16 bay of bent. 12	}-	AIT. SCIL	- measurements	
]	50 ils bay of bent. 11/2 412017 - 12.8 lbs/gal	-	ENDCAT	15" N 1"	
1	' <i>'</i> ''	-	SCREEN	19'7"	
	·	-		Sluts	
			7/7" 2	ان بدَا ر بزرد W-1 (۱۵	
Project No.	Geomatrix	Consultants	17.	Figure	

STRO7

general control of the control of th					STROT		
PROJECT:	RTON REA	ADIN G	L	Log of Well No.			
ORING LOCATIO	N:		TOP OF CASIN	IG ELEVATION:	DATUM: NGVD		
DRILLING CONTRA	ACTOR: R	WSER-MORNER	DATE STARTE		DATE FINISHED:		
DRILLING METHO			3-21-0		SCREEN INTERVA		
<u> </u>	(, 1, 5-		Feet bgs		CASING:		
DRILLING EQUIPM	IENT: ROM	SONIC 8" WER CAS		1			
SAMPLING METH	OD: 10' 5"	MPLE BAPPEL		ERIK MA			
HAMMER WEIGHT	Γ: NA	DROP: NA	RESPONSIBLE G. Hekkenen	PROFESSIONAL	L: REG. NO. -BE-19053		
DEPTH (feet) sample Sample Sample Inches Sample Sinches	Mercon (approximation)	DESCRIPTION RAME (USCS Symbol): color, moist, % by weight, pla comentation, react. w/RCl, yoo. inter-	st., structure,		RUCTION DETAILS LLING REMARKS		
OEPT (fee Sample No. Sample Blows,	0.0	Surface Elevation:		•			
7h0101250		[FILL]? BLACK					
3-4-	DY 13. CINSS LAMINA	TRACE GRAVACE, 69.500	10, 1720pd?				
6-	.20%	GRAVEL, MOISTINGS TRA	3 80% GILLIE	•			
8-	800RC WET, 10% 1	Y CRADED SAND (SP 6" SILT LENSE @7.), DE C1241, SH -, (402, 54 42, -, (90% 42)	Brown, 2) SAND,			
10-	9.5-10'	AS ABOTZ - SILT LEWSE	- - - - - - - - - -	·			
11-				5 and	Tappel		
12-				By VA	W 02 - 20		
13-							
14		1		, WELI	L_OVM M4132.GPJ (6/98)		
Project No. 7169		/ ≫ Geoma	trix Consultants	1/6	Figure		

Figure 1

	SA	MP	LES	42	DESCRIPTION		WELL CONSTRUCTION DETAILS
DEPTI (feet)	Sample No.	Sample	Blows/ 8 inches	(mdd)	NAME (USCS Symbol): color, moist, % by weight, plast., structure, camentation, react, w/HCl, geo. inter.		AND/OR DRILLING REMARKS
15-					POORLY GRADEN SANDWITHGRAVEL (SP)	1 1 1 1 1	DK (2AN ZETVZAV WATER
\7 - -	ning an		2h010		BLACK STAINING, CHEMICAL ODOIL 16.8-18) -	
18 - 19 - 20 -			03210		SANDY LEAN CRAY (CL) [TILL] DK BREANSA GRAY (104 4/1), MOIST, HARD, 90% HIGH ROST FINES, 10% ITED SAND, TRACE FINE GRAVEL 20'- 4" COBBLE-EDSSILIFEROUS SAME AS ABOVE		
21 - 21 -		A STATE OF THE STA			* ,	1	
- 23 -						1 1 1	
24 - -						-	:
25 - - 26 -		Control of the contro					
υη - -					WEN GRADED SAND (SW), DK GREENISH GO (104 4/1), WET 95% SAND GRAVEL, 5%	200	
18 - - 15 -				<u> </u> -	(104 4/1), WET 95% SHWO GRAVEL, 5%	2 5M	no
			;	· ·	4" OLK LENSE@30'	-	

Geomatrix Consultants

Project No. 7169

6 0111 SKØ7

SAMPLES STATE STA	PROJE	ECT	:				Log of V	Well No.	HAWOZ
32- 33- 34- 35- 35- 35- 35- 35- 36- 31- 31- 31- 31- 31- 31- 31- 31- 31- 31	DEPT, . (feet)				(mdd)	NAME (USCS Symbol): color, moist plast., structure, cementation, read	., % by weight, ct. w/HCl, geo.	WELL CON AND/OR	STRUCTION DETAILS DRILLING REMARKS
33 - 35.75' CEAN CLAY LENSE 36 - 37-37.5' CEAN CLAY LENSE 37 - 37.5' CLAY SEAM 40 - 41 - 42 - 46 - 45 - 45 - 45 - 45 - 45 - 45 - 45	i					WELL GRADED SAND (SW) CON	т.		
33 - 35.75' CEAN CLAY LENSE 36 - 37-37.5' CEAN CLAY LENSE 37 - 37.5' CLAY SEAM 40 - 41 - 42 - 46 - 45 - 45 - 45 - 45 - 45 - 45 - 45	32-					·		-	
37 - 37.75' CLAY SEAM 39 - 37.5' CLAY SEAM 40 - 39 - 37.5' CLAY SEAM 41 - 42 - LESS CHEAVEL THAN AROYE LEAN ELLY (CL), CREENISH GRAY (107 571), SOFT, MOST, 1007 HIGH RASS. TIMES, TRACE AMESIND, WELL OWN MAIZE OF J. 1008 WELL OWN M	-							4	
35-35.75' CLAY SEAT 40 - 31-34.5' CLAY SEAT 41 - 42 - LESS CLEAVEL THAN ARONE LEAN ELAY (CL), CREENSH GRAY (107 St.), SECT, WAST, 100% HOW AND THAN AND THAN ARONE WELL OWN MAISS, CREENSH GRAY (107 St.), WERE GROWN HAY "45', FEW BLK. LEMINATIONS, NO ODOR	33 -				,			-	
35-35.75 LEAN CLAY LENSE 39-34.5' CLAY SEAM 40- 41- 42- 43- 44- 44- 45- 46- WELL OWN MAT 22.5P J 1698	34-					34 eing LENSE @ 34		_	
37-39.5' CLAM SEAM 41- 42- 43- 44- LEAN ELAY (CL), GREENISH CRAM (107 St.), SECT., MOIST, 100% HIGH PAST. FINES, TRACE FINESMO, WERL GREENING HIGH FUST, FEW BLK. LAMINAMIONS, NO ODOR WELL OVER MAI 122.691 16988	35 -					35-35.75 LEAN CLAY LENS	Z .	_	
29-39.5' CLAY SEAM 40 41 42 LESS GRAVEL THAN AROYE LESAN ELAY (CL), GREENSH GRAY (107 St.), SOFT, MOST, 100% they RAST. THAES, TRACE FIAL SIMILA WENT GROWN HAS "45', FEW BLK. LAMINATIONS, NO ODOR WELL, OVM MAI 32.6PJ 16:988.	36 -								
40- 41- 42- LESS CLEAVEL THAN AROVE 43- 44- LEAN ELLY (CL), GREAUSH GRAM (107 ST), SOET, MOST, 100% HIGH PLAST. TIMES, TRACE FINESAND, WERK GREDING YUK-45', FEW BLK. LAMINATIONS, MO ODOR WELL OVM MA132.GPJ 16989.	377		$\prod_{i=1}^{N}$						
40- 41- 42- LESS CLEAVEL THAN AROVE 43- 44- LEAN ELLY (CL), GREAUSH GRAM (107 ST), SOET, MOST, 100% HIGH PAST. TIMES, TRACE FAMESAND, WERK GREDING YUK-45', FEW BLK. LAMINATIONS, MO ODOR WELL OVM MA132.GPJ 169881	/~~ -		X						
40 - 41 - 42 - 43 - 44 - 45 - 46 - WELLOVM M4132.GPJ 16:981 WELLOVM M4132.GPJ 16:981	39 -		\bigwedge	-			•		
43- 44- LEAN CLAY (CL), CREENISH CRAY (107 5/1), SOCT, MOST, 100% HIGH PAST. FINES, TRACE FINESHID, WEAK BEDOING HIS -45', FEW BLK. LAMINATIONS, NO ODOR WELLOWM MA132.GPJ (6/98)	40 -					39-34.5' CLAY SEAM			
USAN ELLY (CL), GREAVISH GRAM (107 STI), SOCT, MOIST, 100% THOM PLAST. FINES, TRACE FINESHID, WERLE BELOOING HUK -45', FEW BLK. LAMINATIONS, NO ODOR WELL OVM M4132.GPJ (6/98)	- 41 -							1	
43- 44- LEAN ELAY (CL), GREENISH CRAM (107 S/1), SOCT, MOIST, 100% than PLAST. FINES, TRACE FINESHID, WERKE BEDDING HUK-45', FEW BLK. LAMINATIONS, NO ODOR WELL_OVM M4132.GPJ 16/981	42 -					GCS GRAVEL THAN ABOVE		-	
LEAN CLAY (CL), GREENISH GRAY (107 ST), SOFT, MOIST, 100% that PLAST. FINES, TRACE FINESAND, WERLE BEDDING 44% -45', FEW BLK. LAMINATIONS, NO ODOR WELL_OVM M4132.GPJ (6/98)	43 -			-				1	
48 - SORT, MOIST, 100% that PLAST. TINES, TRACE FINESTIND, WEKL BEODING 44% -45', FEW BLK. LAMINATIONS, NO ODOR WELL_OVM M4132.GPJ (6/98)	- 44 -							-	
WELL_OVM M4132.GPJ (6/98)	45 -					LEAN CLAY (CL), GREENISH G SOFT, MOIST, 100% HIGH PLAST. FIN WEALL BENDING LIVE -45' FEW &	RAY (107 S/1), IES, TRACE FINESANS OLK. LAMINATIONS,	- 	
WELL_OVM M4132.Gr3 10/30/	46 -						,	1	
WELL_OVM M4132.Gr3 10/30/	,		77						
WELL_OVM M4132.Gr3 10/30/	+		X					1	
Z Z Z I I I AND I CONTI	48 -		·						WELL_OVM M4132.GPJ (6/98)

				* v		,
PROJECT:	Mo	RIC	n reading			No.VAWOZ-
30RÌNG LO	CATIO	ON:	16' SOUTH OF STRO7	TOP OF CASING E	TOP OF CASING ELEVATION: DA	
DRILLING C	ONTF	RACTO	• •	DATE STARTED:		NGVD DATE FINISHED:
DRILLING M			ROTASONIC	TOTAL DEPTH:	17	SCREEN INTERV
				feet bgs DEPTH TO FIRST	COMPL.	31.5 -46.5 CASING:
			: Bouttle Casus, 40 INNER CASING	WATER: , NA	\ \ \M	
SAMPLING	METH	IOD:	10' SAMPLE BARREL	ER		NSIELL
HAMMER W	/EIGH	T: N	DROP: NA	RÉSPONSIBLE PRO	JFESSIONAI	L: REG. NO. <u>BE 1995</u>
(feet) Sample No. Sample	$\overline{}$	OVM (ppm)	DESCRIPTION RAME (USCS Symbol): color, moist, % by weight, plast., st comentation, react. w/HCl, goo. inter.	ł ·		RUCTION DETAILS LLING REMARKS
Sample No.	B Bo	ÓΞ	Surface Elevation:			
1-			SEE DESCRIPTIONS PROM S	51207 5'50-TH) -		
2-			DK BRUIN FILL			
3-			·			
4-			Q35			
-			BROWN CLAM	.		
5- -						
6-			TIR		\mathbb{Z}/\mathbb{Z}	
. 7-			SAND(SP) PUORLY GRADED			-4" DIAMETERS FLUSH THEEADED ? CASING WITH O-1
8-		.·	Puores GRADED			
9-			*		Y/I	
10-						
- "						, I
11-						~ CENTRALIZE
1,2-					/	
13-						
14				. -		. 0/44 144 22 02 1 2
Project No.	716		∕∕∕ Geomatrix	Consultants	VEL.	L_OVM M4132.GPJ (6/98 Figure

		145			Log of W	Vell No. VAW02-40
DEPTH (feet)	Sample C		Blows/ The Sinches	(wdd)	DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
- 15 -					-	
16-				,	BLACK MATERIAL	
17-						
18-			-	i.	CLAY (CL) (TILL]	
19-		Ц.				
20 -						
, -						
22-						
23 -						
24-			. '			
25-					- -	
- 26 -	,-					
27 -	ge je			٠ ક	WELL GRAPED SAND (SW)	0.06
18 -	7	,	r'		-	CC 60 BENTON CHIPS
24 -			·		CLAYLENSE 29-24.8	29,5
30.					-	
31_		Ц				2/ WELL_OVM M4132.GPJ (6/

PROJ	ECT	<u>-</u>					•
FROS			NÐÜ	YON	READING	Log of	Well No. UAW02-40
DEPTH (feet)	Sample No.		Blows/ 8 inches	(mdd)	DESCRIPTION NAME (USCS Symbol): color, mois plast., structure, cementation, rea	t. % by weight, ct. w/HCl, geo.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
		П			with GRANZE SAMS (SON) CONT.		CENTRALZER
32-						31.5 705	
33 -							
34 -							
35 -					" CLAY LENSIZ		
36 -					4"CLAM LIENSIZ		
71 -				!		·	
39 -	·				SAME AS ABOVE (SW)		
40 -							4"DIAMETER CONTI WIZAP STANLESS SCREEN WITH O. SLOTS
41 -					15.2 1×10	GROUT	
42 -					4-12,9*/201 First returne 12,514101 5-13.0*/gel approx.batch = 1011	12,6 165/99 1 - 12.9 165/98/165 = bent, 3×47/165	
43 -					approx. Julian 15	12.8 155/3ac	#6 GLOSAL FILTER PAC SAND
44 -		M	7			THATAL.	
45 -				u5.6	SAME & ABOJE	Chips	
_					Soft (a) Entre Eem	5"- FOT TO SLUTS 36.5	5" (A) CAP
					1350 purged scerep - 4	174 52015	108 pe 47
48-					TD BORIN	NG (4") @ 49"	. WELL_OVM M4132.GPJ (6/98)
Proje	ct N	o. '	7169	7	/ / ≪ Ge	omatrix Consultants	Figure (cont.)

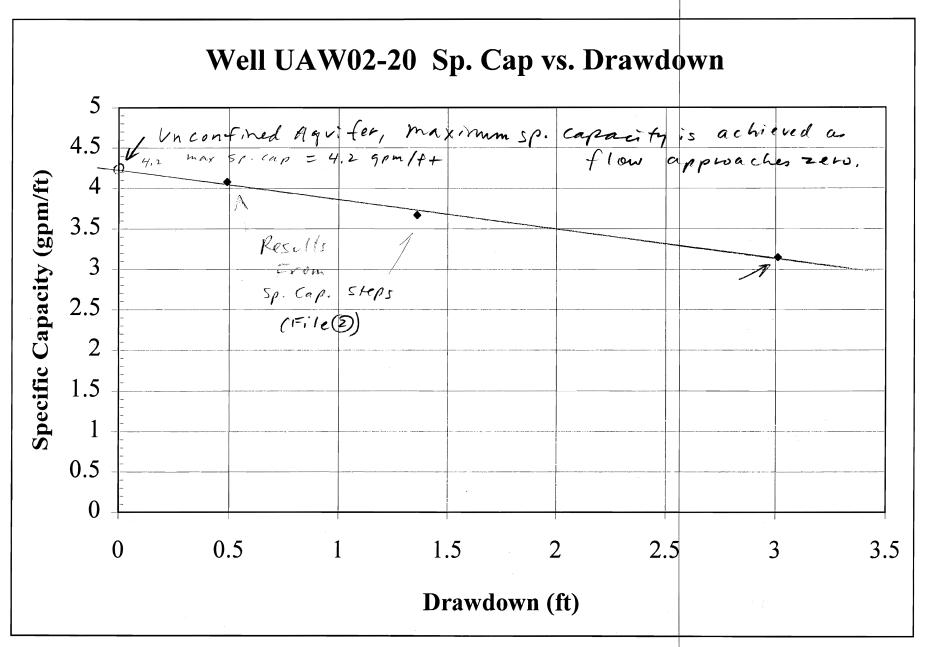
Distr., st	DESCRIPTION USCS Symbol): color, moist, % by weight, tructure, cementation, react. w/HCl, geo. inter. WELL CONSTRUCTION DET AND/OR DRILLING REMARKATION TO THE AND/OR DRILLING REMARKATION TO THE AND/OR DRILLING REMARKATION (10 Y/2 5/4), F(RM TO HARD)	TAILS
32- 1" GRAJEL LANGE HELLOWISH BROW	inter.	
YELLOWISH BROW	1 × 2-32.1 VN (10 YIR 5/4), FIRM TO HARD	
22 1 111 1 1	1 · · · · · · · · · · · · · · · · · · ·	
-		
REGARLY CARADEDS	MNY(SP): LTOLIVE BRUNN(2.)7 54), 4"DIA. SCH FLUSH-THE	にかい
36 -	PVC RISET O- PINGS	R WIT
377		
38 - Maranel 38-3	18.5 CEIMEN GRUUT	ITE
	EVE, TRACE FINES	
40 - 40 - 40 - 40 - 5 5127 -	ייינ (איינ) איינ (איינ)	
42 -		
43 -		
44 _	QOO BENTONI	TF
45 -	US 3' CENTRAL	12612
48	WELL_OVM M4132.GP	

PROJ			スハ	e	EADING	Log of \	Well	No. VA	N20-600	
				<u> </u>						
DEPT. (feet) Sample No. No. OVM (ppm)				(wdd)	DESCRIPTION NAME (USCS Symbol): color, mois plast., structure, cementation, rea inter.	it, % by weight, É	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS			
,		Т			POORLY GRADED SAND (50) CON	٧٢.	T			
- و الم		1			SAME AS ABOVE] -			
50 - -> -							— —			
51 -		+					=	- +		
52 -									-46 GLOBAL FILTER PACIC SAND	
53 - -) ()			
54 -								: ,		
α -							9	;	-4"DIA STAINCES STEEL WZAP AROU SCREEN WITH OF SLOTS	
54 -						?				
57 -					NELL GRADED SAND WITH GRA YELLOWISH BROWN (10YR 5/4) SAND, 240% GRAVEL (0-1"), TRI	YEL (5W):), WET, 60%			S C IZTÉN	
58 -					JANO , ~ 40% GRAVEL (0-1"), TR	ACE: FINES	-	-5	10' 10'	
59 -	•	 			SIME AS ABOVE] s´	
60 -					SANDY CEAN CLAY(CL)	TILL]: LT OLIVE	is Raid		5.5" END CAP	
G1 -					(2.54 5/4); ~80% MEDRAST FINE SANDA CRAVEL, NEBY H	TARD DEN-MOIST		a.s	- 8"DIA CHILL B	
6Z - -				(DK GRAY = V U/	EU MATRIALS!	0000		G200 <u>F1</u>	
63 -				,	1-29	- hysand - HHT I In Bac of Curiss	000	- SENTON PEU 1-BAG, S GLUV:	ETS 1-13.3 2-13.2	
10.					10-01 0745 - START WILL ING GROUT 0922 - GREVE TO SUZEACE TREMIETIPE SET @ 40 BGS	E		HTCH: 8-47	16 PORTZINO ilcacilad bentonne ge	
65-				L				WELL	OVM M4132.GPJ (6/98)	

Subject_ -	elect/peterm	ine Correc	7 Sp. Cap	Project No	9
ъ.	and Calcul	are ///	<.	Task No. Agvitu	Test
By M	2 B	Checked By	RDC	File No. (4)	
	112/02			Sheet/of_	9
Gsti	mate T,K-	from S	p. Capacita		
	Method: 1.	Plot	sp. capacity	vs, drawdown fr	om each
		step.	1 step test.		
	·		if the frend to 0		
	en e	to f	ind MAXIMUM Istem is Union	rfined	City
4	3		ua /ton's (1980		and the second
A MARK IN THE STATE OF THE STAT		to Find	T that yiel	'ds that Sp. C	ap.
So the experience of the control of		giver	n time, well raine storage coeff	Vivs, and forage c	vefficient,
en a successive and a s		ASSU	me Storage Westil	(confined) = 0,001	(d.m)
aksis salah sa		~ .	ne time = total por K from T and sa		
h.	ell VAW 02-	20		College Colleg	
W. W. L. C.		x mm Sp.	eitie Capaitre Capaitre	(art) = 4,2 9p	<u>m</u> ++
and the second of the second o	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		Thursmis swity	and the second of the second o	e gergen det groupe governer i verkledet omteger.
n		Usiny h	altous equation	on - see attach	ed Table)
1			= 5,000 9		
1 MAN 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	er and the second secon	the second of the second of the second of the	hydraulie Con	and a state of the control of the state of t	salar customer professional acceptance of the
			k = =		The second section of the second seco
y -			/-		+ (9px/r,
			re k = hydranl T = Transm	is (.v. ty (apd)	(F+)
1			b = Saturat	ed Ihickness L	t+J
		at well	V/MOS-50 , 5	(From File (3)	= 6.34+
* " * * *		<	= 6.3		
		And the second s	= 793.6 gpd/ft	2 0 - 106	f+/day)

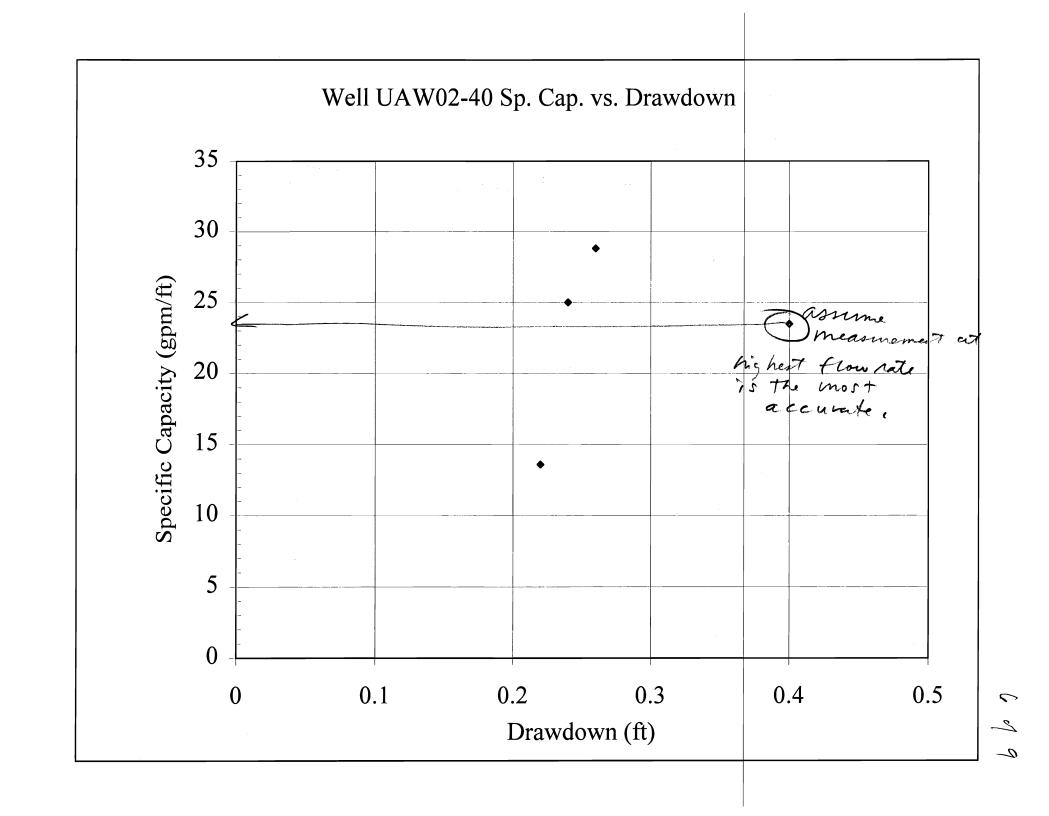
Subjec	ct Determine sp.	Cap. Ca	Itulate T, K	Project No	7169
	mag	•		Task No	
	,			File No	
Date	3/1-/02	Date	53-02	Sheet	of
	Well UAU		ats measu	nd at hig	heit
The second secon	Flo Th (Sp.	w Rate (9) is is a content capa	city measur .5 gem) probable fined a guiter city = 23,5	y most de w/cs = 0.000 gpm/ft	cumte (assumed)
		timated At well K =	46,500 attached Tars ing haltons k van 02-40; b 46,500 19.6 ft 2,370 9	ble, trial and eguation) Sut Thick (From	T e propr
And the state of t			= 317	ft/day	
		te: values Since well	may be shas only	72 % pen	derestimated ettation le 3)

	n Determine			Project No. 7/69 Task No
	MEB	Checked By		File No
Date	3/12/62	Date	5-3-02	Sheet 3 of 9
	Mell VAN		- apacity =	0,369pm(H
.,,				and the control of t
er e		with in Cal	nginter, >,	rote Therefore,
,	Theor	etical sp. ca	ip. at 0 f	Ion was used.
and the second	re terrer i savit di dilata di distribuenti sudditata i teledici distributi escendici.	Sp. Cap	= 0.36 gpn	o. capacity declines rote. Therefore, low was used. alft (Actual sp. cap is higher sin (Trial + Eno
A MARIN AND A	· CsA	mated The	ans missivity	() to all the end
er there is an a particular of a		_	on's equa	
Secretaria (S. Dore) (Sec. Sec. Sec. Sec. Sec. Sec. Sec. Sec.			22. A. abad Caranda a 1946 1 1966 1 1976 1.	
to an order or an area	The second of th	1 Transfer 2	80 gpd/f	t = cs = 0.2 (assumed)
	(Actua	I t is high,	er since well !	Conductivity
	en antara atan mang amarang laman sani laman manara sa sani an ma	/< = -	The second of the second of the second of	
			b d Thickness	and the second s
an maken self of part of	and the second s			= 21.71 ft (From File(3))
A WALLES OF STREET	i como esta esta esta esta esta esta esta esta	(well,	penetrates on	ly 52% of this (Fila)
		k = .	280 = /2,	9 9pd/
grayyy a sorror	ignore and the second general management and a second constraints of the second constraints of the second general to a second	en de la companya de	12.9 (gal /ff3)	The first of the f
			12.9 (gal) (ft3) = 1	1/ tt/day
		A CONTRACTOR OF THE PROPERTY O		
ed da et emige	ar et a seminaria, est a se a aran que tres sur sur sur se a aran. Transferior	tund levis	higher since	well is partially
		o enetiating		well is partially
A 40 MM		in the second	ing the second of the second o	and the second s
to the original o	on, in the experience of the control	en e		and the second of the second o
****		en e		
			e de seguina de la companya de la co	and the second s

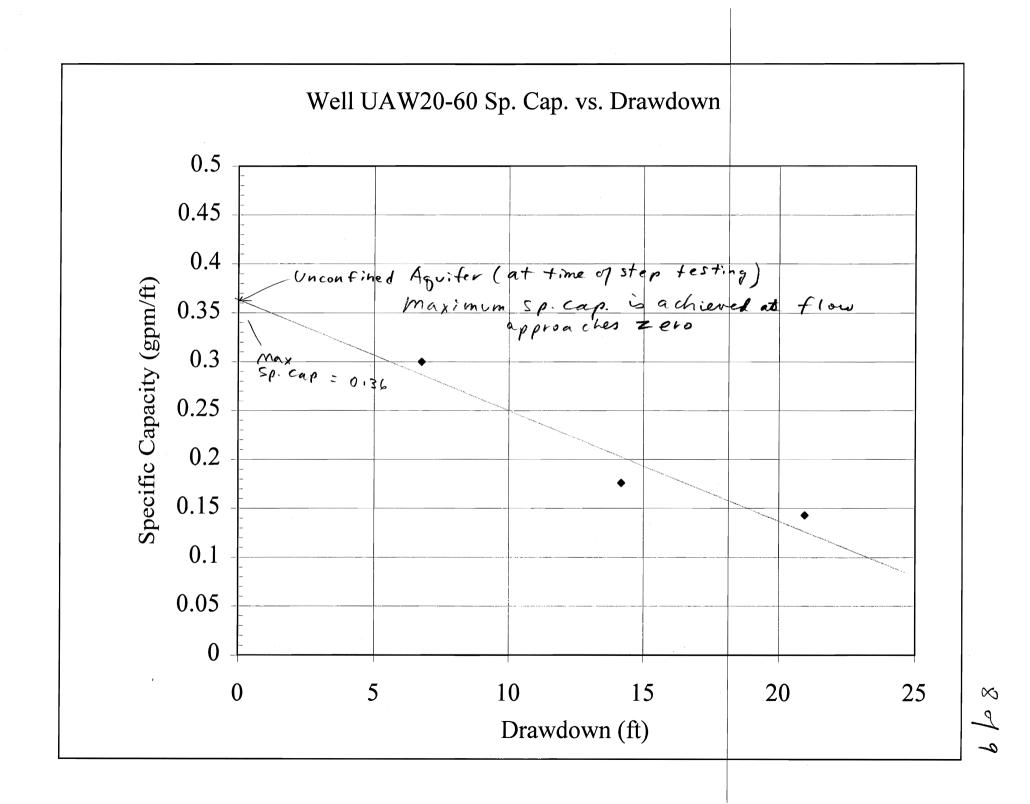


Well UAW02-	20				
Equation for S	pecific Capacit	y: (Walton	, 1970)		
q _s =T/(264log(7	$\Gamma t/2693 r^2 C_s)-65$.5)			
				Unconfined	
Sp. Cap.	Trans.	time	well radius	Storativity	Apparent
$\mathbf{q_s}$	T	t	r	C _s	Ratio
gpm/ft	gpd/ft	min	ft	dimensionless	T/q _s
3.87	4600	180	0.166	0.2	1188
3.95	4700	180	0.166	0.2	1190
4.03	4800	180	0.166	0.2	1192
4.10	4900	180	0.166	0.2	1195
4.18	5000	180	0.166	0.2	1197
4.25	5100	180	0.166	0.2	1199
4.33	5200	180	0.166	0.2	1202
4.40	5300	180	0.166	0.2	1204
Note this equat	ion does not acc	ount for redu	ction of saturated	I thickness	
in unconfined a	quifer wells.				

Walton, W., Ground water Resource Evaluation, Mc Graw-Hill, New York, 1970

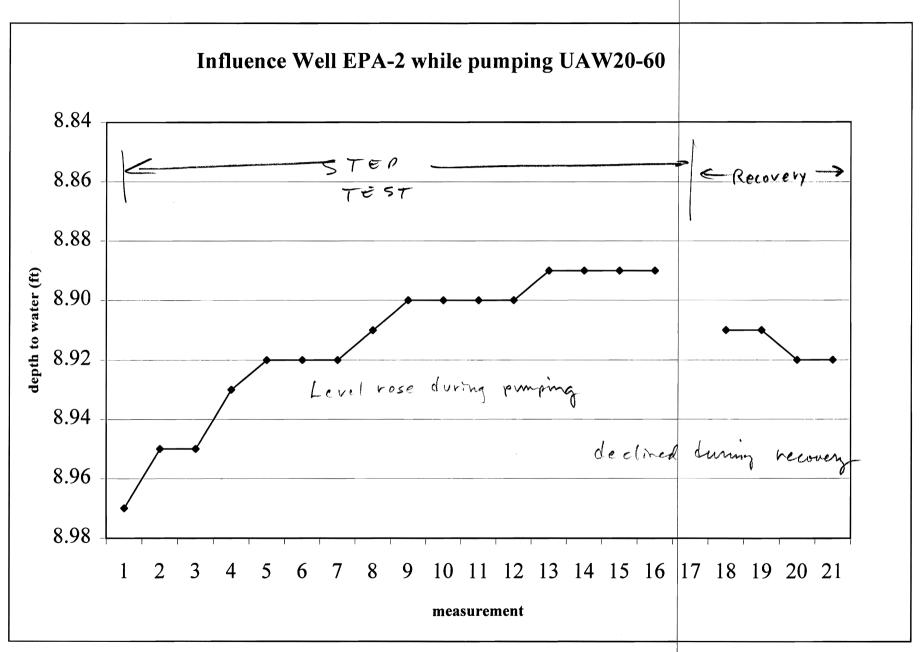


Well UAW02-	40				
Equation for S	pecific Capacit	ty: (Waltor	, 1970)		-
q _s =T/(264log(7	$Tt/2693r^2C_s)-65$.5)			
				Confined	
Sp. Cap.	Trans.	time	well radius	Storativity	Apparent
$\mathbf{q_s}$	T	t	r	C_s	Ratio
gpm/ft	gpd/ft	min	ft	dimensionless	T/q _s
20.45	40000	84	0.166	0.001	1956
22.85	45000	84	0.166	0.001	1969
23.33	46000	84	0.166	0.001	1972
23.57	46500	84	0.166	0.001	1973
23.81	47000	84	0.166	0.001	1974
24.28	48000	84	0.166	0.001	1977
24.76	49000	84	0.166	0.001	1979
25.24	50000	84	0.166	0.001	1981



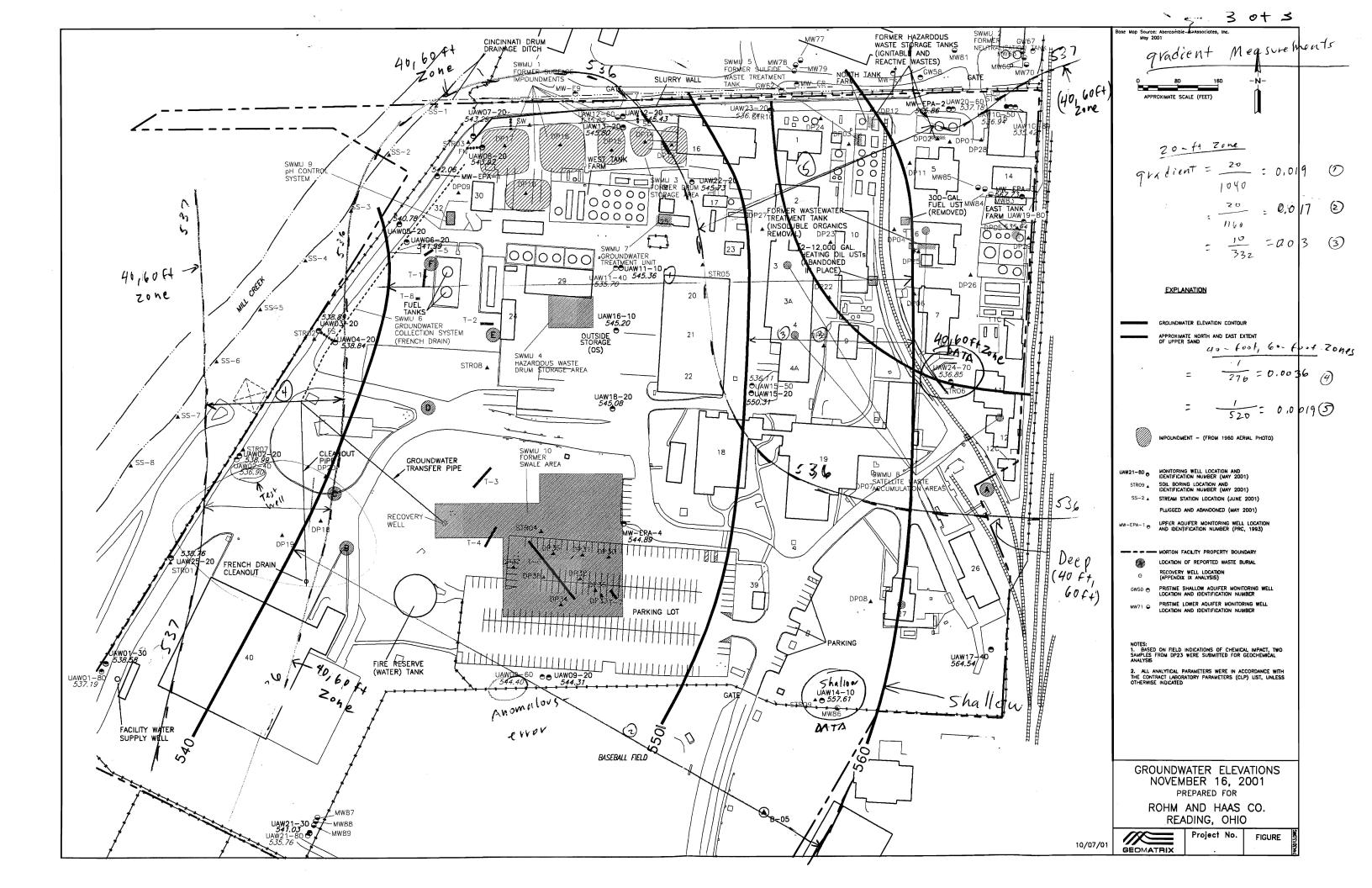
Well UAW20-					
-	pecific Capacit	• .	ı, 1970)		
q _s =T/(264log(T	$Tt/2693r^2C_s$)-65.	.5)			
				Unconfined	
Sp. Cap.	Trans.	time	well radius	Storativity	Apparent
$\mathbf{q_s}$	T	t	r	C _s	Ratio
gpm/ft	gpd/ft	min	ft	dimensionless	T/q _s
0.32	250	87	0.166	0.2	770
0.34	260	87	0.166	0.2	775
0.35	270	87	0.166	0.2	779
0.36	280	87	0.166	0.2	783
0.37	290	87	0.166	0.2	787
0.38	300	87	0.166	0.2	791
0.39	310	87	0.166	0.2	795
0.40	320	87	0.166	0.2	799
Note this equat	ion does not acc	ount for redu	ction of saturated	l thickness	
in unconfined a	quifer wells.				

Subject	Effects	of Pumping	step	Tests	Project No. 7/6 9	
Ву	Mag	Agrifers Checked B	a bove +	Zone	Task No. A rai fee Te	st
					File No.	
Date	3/12/02	Date	5-3-02		Sheet of	-
	And the second of the second o					. ,
entractific security	T	tz ()		- Tro	a le instana	
		The second of th			only instance	
o tota etta tuesta oson	dun	my Step	Testend	1 4 B	ecember 2001	Somework was religion
	Control to the Control of the Contro	mental and appropriate the control of agrees and account.	er to the transfer of the second		vertically	
v						t
2	adj.	a cens we	U XXP	enme	significant	
## 5# 988 S / \$1 - 441	- Char	ge.	and the second of the second o	samble and one of the second o	and the second flag is to be said to the promotion of the control of the control of the control of the said to	
ad Mills drawn in a region	, i y je i mimi maje nje seku mimi i mje se					
	enter en	entre en			eminer en inne e e e emineraria en el esperante en el esperante en el encidor de el entre el entre el entre el El entre el	e gegeneration en
e dat - ee soo ee eeks op 'n ee gebeure	grup ar an ar a san san an ann an	open Processin to a second	nou	wa He	levels u strou sou peu interpret distiller our peut mes ar stroef au vertion tal vert a correspondi	: iden sower einswerd
and the second of the second	and the second s	entre	and the second s	the street of the following of the street street	And the second s	
all the second s	/ V	ising di	ung 1	ringen	giana	. I was seen a significant
		eclining				a a grandana a a
	and the control of th		J		and the state of t	
Profesional Control of the Control o	mi i accesso de manier e com ce e a seceso de la companione de la companione de la companione de la companione	and the second s		and the second second second second		
1 Mg M 2 1 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	This	s is the o	po osi	re of	what would	
and comments with a second of	and the entire state of the sta	henra	approved to the state of the state of	grand Artista (and Artista (and a state of the state of t	en i i i i en	e de la companya de l
	en e	- ex per		na nimagaa ah a	and the second s	
	The second secon		en e			in annex
		is conclu	rosel t	hat N	10 leffect	
	- Lac					
este il rivere i	× · · · · · · · · · · · · · · · · · · ·	wobserv	ed in	agace.	nt Zones.	
A Maria Mayor Control of the Control	en e					
i ada maranata di si mi	Single Contract of the Single Contract of the Contract of the Single	n in the grant of the section of the		and a second of the stage	en er kantalen eta erren e	er vestaner
e we what is a	erent eremeller i de eremeller eremeller eremeller eremeller eremeller eremeller eremeller eremeller eremeller			W W T - W T - W T - W T - W T	and the second of the second o	
	in the second of	ing and the state of the state	en e		in the second of	
en a la capação de la						
					Market and the second of the s	
***	e de en				and the second of the second o	
					and the state of t	



	imated Ground water		Project No. 1/169 Task No. Agrifer test
By VV(2)	Checked By	KDC	File No.
Date 4/16/	2002. Date	5-3-02	Task No. A surjer test File No. 6 Sheet of 3
Purpose	Estimate l'	novizohtal esults of S	groundnater flow tep-drawdown testo.
Method	: Use Dave	j's Law to	estinate flou
Construction of the second of			
Data:	Hydranlir C Step-dran	onductivity ndown te (File (7)	y values from st Transmissivities
The state of the s			Levels measured
	onlovem	ver 16, 206	1 (See Attacked Map)
	a substant reconstruction special special service retraction as gasts a rate	emen no reches accuse vision on a sistema a computer control of	
	Assume: Ef	fective por	05.12 si htis
Calcula	43		
we	n vanoz-zo		
er om en gestammen er om en	and the second s	06 ft/lay	= hydraulic conductivi
		0.019	ft/ft = quadient
	$\phi =$	0,25	= porosity
	$\nabla = \frac{k \lambda}{\phi}$	= (106)(0.c	019) Pt st = V= 5 day ft = 8.1 ft da
The state of the s	V =	2,940 f+	peryear

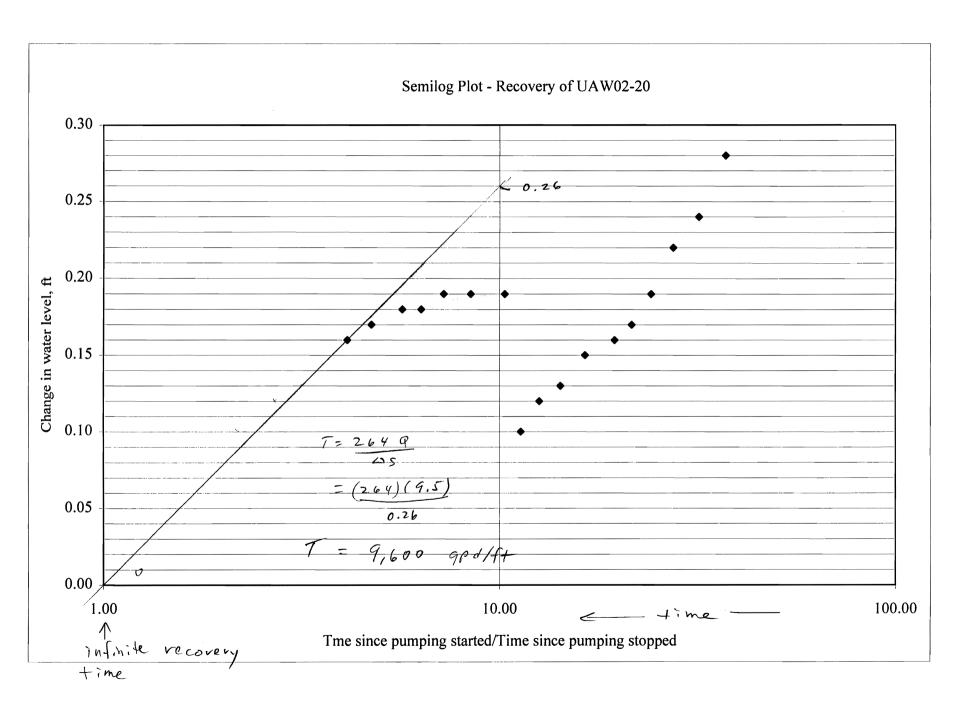
Subject Estimuted	Cro undus te		_ Project N		167
Зу	Checked By	RDC 5-3-02	File No		, 2
Date	Date	2-2-00	Sheet	<u> </u>	_ Of
Well VAN					
	k = 3.	17 ft/dag			
	9 = 0		The state of the s		magazina anta di santa di manazi di
	= 10 1	0,25	7,9) =	2,4	f+/kay
	and the first trade of the designation of the section of the secti	8,80 FH,	and the second s		
de la companya de la	and the second s				
Well VA	u 20-60				
	K	7 ++ / day		etarione in time i como e es	
		0,0019		Y (Agreeping) no. man ni galligati	
	q = 0	. 25		The second secon	
	Ki =	(1.7) (0:001	9)		
	V = 0,0	13 ft/da	y (A COMPANY OF THE STATE OF THE S	
	V = 4 7	, tt/ye	at		

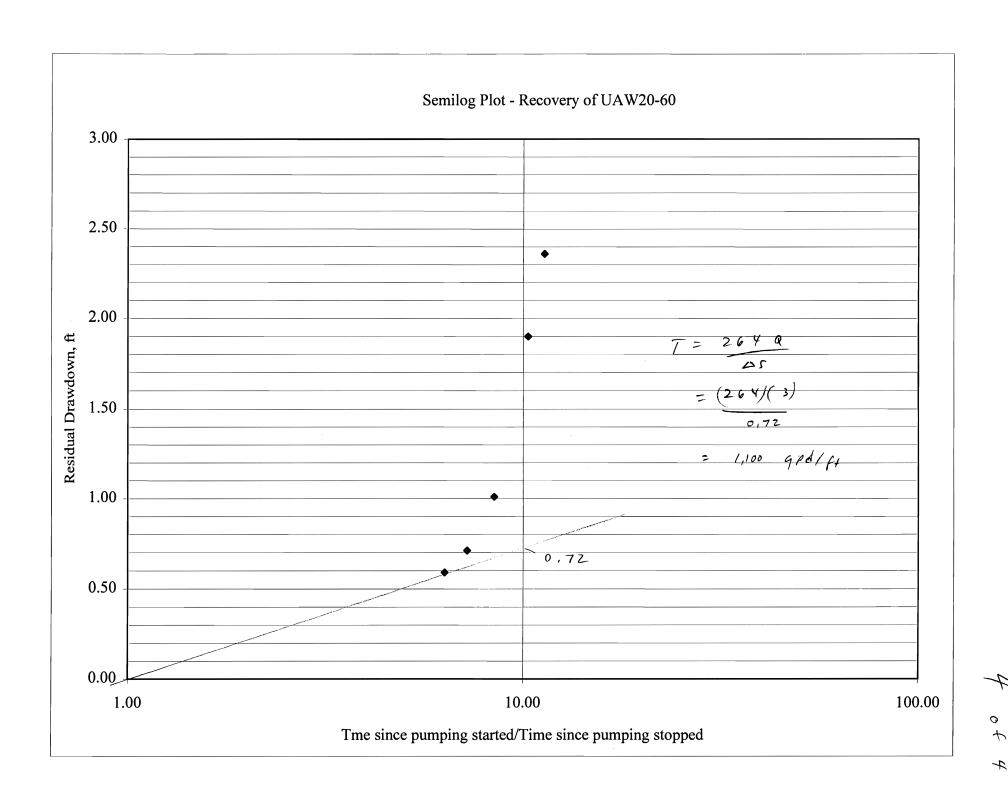


SubjectCalculate	From Se	milos Pl	0+	Project No	7169
By MEB	Checked By	Roc	•	Task No.	of 4
				File No.	//
Date 3/12/02	Date 5	-3-02	· .	Sheet/_	of
Estimale	e T from	train	nsieut	· ua te	n level
\mathcal{Q}_{α}	ata in R	e cover	7 20	rivd	
per addition for influence of the period for a first consequent of district in the period of the per	New National Control of the Control	The second of th	azer i de en	Common State of Common State o	erk Treegaard (1915), virkela vaara verge alahan 1992 ah miska operativaletak
me tho	1: Theis	recon	en p	10+	The second secon
· · · · · · · · · · · · · · · · · · ·					and the second s
enceura com contractor de la companya del companya del companya de la companya de		20	en e	nger en folkskip om kandigger fra genser E	es communes com emportunes por meses communes in an access of the community of the communit
	whi	. T	- trans	emissivite	(apd/
	wh	ere			// //-
en an angel en		Q =	= fina	uhflou va	Ae
			O	1 well	ite 9pm
					Management and the place and the control of the con
					semilog
add ag meille gang Kalayan Kalayan an mengelah kelalah kelalah di sebagai kelalah di sebagai di sebagai kelala Bermanan	er geroen en e				akata ing pagapagan ana araw
(Theis, c.v	-, 1935, The relation account the rate and discount the rate and discount UAW 02-20	n between the	wering the	109	cycle)
Well	UAW 02-20)	ground - wa	ter storage, 7	lans. Am.
Silver and the control of the contro	Marketin in the Administration of the Company of the Company	and the second second	Geoph	Isical Union	, P, 519 - 524,
	T = 269	5		and the second s	er promoner i servições and estadorio anales.
	T = (260	4) (9.5)			
		0.26			en er en en er er en
1 (1 a) (1 a		Service Community Community	4011	z.	
	7 = 9	,600	9/19/		(vs, 5,000) from sp. cap.
				0	and green and annual control of the same of the same
and a second process of the second process of	slope estim	ated u	sing	kart c	Vata
	point and	0.0 d	rand	oun a	t
	infinite"	recove	ery ti	ne	
The state of the s					and the second of the second o
Well UAW					The state of the s
	No Usable	recove	ry dat	9	
· .					

Subje	ect Calculat	leT.from.	Senilog Plot	Project No	7169
Ву	MEB	Checked E	by RDC	Task No	
	3/12/02		5-3-02	Sheet	of4
		w 20 - 6 c		and the second s	
	well va				
	nggan par in kacamatan kanan kan Kanan kanan ka	i um respecie e médicam série exceléra as los empos com empos acestras e Terres Escripere		auten 1942-beta - Attach III. Autoria (1940-1940) bereite (1940-1940) beta	der de la company de la compan

m remark	Segment of the contract of the	i de la compania de l La compania de la compania del compania de la compania de la compania del compania de la compania del la compania del la compania de la compania del la c	(264)(3)	and the second of the second o	
			0.72		
	e de la composición	, T ==	1100 60		
ACM and the consider typing a		The second section of the section of	1,100 900	I for the second	(VS, 280)
	and the second s				from sp.cap.
and the second second		sloge e	21. Von Fed Wis	in last d	and a second control of the control
*******************************			and 0.0		1
			rife" re con		
	i supramentati ne e no	eats		e man ili ummummettikuksi. Ilikee isti kaandan muu elektyisi saadana.	mananan yayan da ka mata ka mata ka mama da ka
	and the same of th	The Control of the last of the		Final flag vota	and the second s
an and an	in the second process of the second process	to entire	tion made: e flow peri	ed, not just	
	And the second of the second o	final ste	e flow peri		
			Sp. Cap.	can be af	fee ted
2009-270 g. sha	of the second se	by well	efficiency	the included out the discount of the company of the second of the company of the	entropping page and the description of the second of the s
			semilog p		
			icient to def	ine thre s	traight-line
galatin keya sasa	and the second of the second o		en ervour op de see general de see g General de see general de see		ethinaa aasta oo ka ka oo ka
	en en servicio de la companya de la	well wa	es partially	penetrati	ing
			The second secon	and the second s	The second of th





APPENDIX D

QUALITY ASSURANCE/QUALITY CONTROL

TABLE OF CONTENTS

D.1.0	OVERVIEW	1
D.2.0	FIELD QUALITY CONTROL	2
D.2	.1 Precision	2
D.2	.2 Accuracy	2
D.2	.3 EQUIPMENT AND TRIP BLANKS	3
D.2	.4 Field Procedures	4
D.2	.5 DOCUMENTATION	6
D.3.0	LABORATORY QUALITY CONTROL	7
D.3	.1 GEOTECHNICAL ANALYSIS	7
D.3	.2 Laboratory Analytical Procedures	7
D.3	.3 Data Validation	7
D.4.0	PROJECT COMPLETENESS ASSESSMENT	10
D.4	.1 FIELD MEASURED PARAMETERS	10
D.4	.2 Analytical Data	10
TABL	LES	
D-1	Duplicate Soil and Sediment Samples, Volatile Organics Detections	
D-2 D-3	Duplicate Soil and Sediment Samples, Semivolatile Organic Detections Duplicate Soil and Sediment Samples, Pesticides and PCB Detections	
D-3 D-4	Duplicate Soil and Sediment Samples, Inorganic Chemical Detections	
D-5	Duplicate Groundwater Samples, Volatile Organic Detections	
D-6	Duplicate Groundwater Samples, Semivolatile Organic Detections	
D-7	Duplicate Groundwater Samples, Pesticides and PCB Detections	
D-8	Duplicate Groundwater Samples, Inorganic Chemical Detections	
D-9	Summary of Detection in Project Equipment Blanks	
D-10	Summary of Detections in Trip Blanks	

ROHM AND HAAS CO.
FACILITY INVESTIGATION REPORT
REVISION: 00, JUNE 2002
APPENDIX D
PAGE ii OF ii

TABLE OF CONTENTS

(Continued)

ATTACHMENTS

QA Field Audit Report #1
QA Field Audit Report #2
Logs of Variance, Nonconformance, or Clarification
Severn Trent Laboratories Letter Dated April 19, 2002
Quality Assurance Review Dated May 10, 2002
Quality Assurance Review Dated October 5, 2001
Quality Assurance Review Dated September 25, 2001

ROHM AND HAAS CO.
FACILITY INVESTIGATION REPORT
REVISION: 00, JUNE 2002
APPENDIX D
PAGE 1 OF 11

Appendix D

Quality Assurance/Quality Control Report

D.1.0 OVERVIEW

The guidelines and requirements for quality assurance/quality control (QA/QC) relating to the Facility Investigation (FI) at the Morton facility are provided in the Quality Assurance Project Plan [QAPP, Appendix A of the FI Work Plan (Geomatrix, 2000b)]. The QAPP was prepared in accordance with the U.S. Environmental Protection Agency (USEPA) Region 5 policy and was conditionally approved by the USEPA as an attachment to the FI Work Plan.

As a matter of procedure, all deviations from the FI Work Plan were documented during the project. Deviations are grouped into three types; variances, nonconformances, and clarifications. When field or related conditions dictated a change from practices specified in the FI Work Plan, this was logged as a variance. A nonconformance report was generated for activities that failed to comply with the requirements of the FI Work Plan through error, miscommunication, or oversight. A clarification report was generated for activities that required additional explanation beyond the description in the FI Work Plan. Documentation of variances, non-conformances, and clarifications are included in this Appendix.

QA/QC procedures for the FI are divided into Field Quality Control and Laboratory Quality Control. Field Quality Control addresses the QA/QC procedures implemented by the Geomatrix field crew. Laboratory Quality Control pertains to the QA/QC procedures implemented by Severn Trent Laboratories (STL) and the data validation performed by Environmental Standards Inc.

D.2.0 FIELD QUALITY CONTROL

D.2.1 Precision

Precision is an expression of the degree to which two or more measurements are in agreement. Precision of sample collection procedures was evaluated by the collection of duplicate samples in the field. Duplicate samples are collected, analyzed, and compared to the original sample results to check for sampling and analytical reproducibility. The results of the duplicates are summarized in Tables D-1 through D-8. The relative percent difference (RPD) was calculated for each duplicate set using the following formula:

RPD =
$$\frac{2(S_1 - S_2)}{S_1 + S_2} \times 100$$

where $S_1 = \text{sample result}$

 S_2 = duplicate result

The general RPD goal for the FI was 30 percent, although it was noted in the QAPP that this was a guideline, rather than a rigorous target. The great majority of duplicate analyses met this goal. There were a small number of outliers (i.e., outside the 30 percent goal), typically in soil samples and in the metals results in groundwater. The inherent variability in the soil matrix makes reproducibility of results more difficult. Variations in groundwater metals concentrations are likely attributable to the effect of water turbidity and the affinity of metals to sorb on solids. There was one exception to this typical situation; the duplicate groundwater samples collected from UAW19-80 on November 12, 2001 had large variations with both VOC and inorganic parameters. On a whole, however, the precision observed through the evaluation of duplicate samples for the project was good, and typical of an environmental investigation.

D.2.2 ACCURACY

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. The accuracy of field measurements was assessed through

instrument calibration standards and repetition of measurement results throughout the project. Field instruments measuring pH, dissolved oxygen, turbidity, and specific conductance were utilized as part of the investigation. The Geomatrix field crew calibrated field instrumentation each day the instrument was utilized. The calibration records, which were provided in the quarterly Progress Reports, document the daily field calibration of equipment against standards for pH, dissolved oxygen, turbidity, and specific conductance. A review of these records indicates that there was good equipment accuracy and achievement of the project goals specified in Table A3-3 of the QAPP. However, as noted in Nonconformance Log 018, consistent field calibration does not preclude performance problems with field instrumentation.

As specified in the QAPP, it was not a requirement to evaluate water level measurements for accuracy and precision in the field. A comparison of water level measurements from the various rounds of readings, however, indicated one suspect reading in November 2001 at UAW09-60 (Nonconformance Log 019). It is suspected that this inconsistency was due to operator error and does not reflect any problems with field instrumentation.

D.2.3 EQUIPMENT AND TRIP BLANKS

Equipment and trip blanks were collected in accordance with specifications of the QAPP. Equipment blanks are used to assess the potential for contamination resulting from field equipment, field procedures, or ambient conditions. Trip blanks are used to assess the potential for contamination of samples during sample shipment and storage.

Table D-9 summarizes the results of project equipment blanks. With the exception of a few inorganic compounds (iron, copper, and sulfide), every detection is qualified as estimated (at concentrations less than the reporting limit). The organic compounds detected in equipment blanks were also detected in FI samples of environmental media. The same is true of the inorganic compounds detected in equipment blanks. The low concentrations measured in the equipment blanks suggest that ambient conditions may be slightly impacting project samples, or that decontamination procedures were not always

completely effective. The impact to project samples is minimal, but more rigorous decontamination is recommended for all non-dedicated sampling equipment. The concentrations measured in the equipment blanks are low, and, as noted above, at concentrations less than the reporting limit. Additionally, a conservative approach was taken when preparing the Baseline Risk Assessment (Geomatrix, 2002), in which no compound was eliminated based on the predominance of that compound in quality assurance blanks.

Table D-10 summarizes the results of project trip blanks. With the exception of one detection of methylene chloride at a concentration of 1.1 micrograms per liter (ug/l), all of the detections in trip blanks were estimated (i.e., at concentrations less than the reporting limit). The majority of the compounds detected in project trip blanks were also reported in the associated laboratory method blank, as indicated by the data qualifier "B." Based on this qualifier, the acetone, methylene chloride, and trichloroethene observed in trip blanks are likely derived from laboratory contamination. The estimated detections of 2-butanone and carbon disulfide in trip blanks may be attributable to ambient conditions in either the laboratory setting or to some effect of the sample shipment procedure. Based on the extremely low concentrations observed, however, these results are not considered to indicate a systematic problem with the sampling or analytical program. Additionally, a conservative approach was taken when preparing the Baseline Risk Assessment (Geomatrix, 2002), in which no compound was eliminated based on the predominance of that compound in quality assurance blanks.

D.2.4 FIELD PROCEDURES

The procedures specified in the FI Work Plan, including the QAPP and the Field Operating Procedures (FOPs), were adhered to during the investigation, with the exceptions noted on the attached Variance Log or Nonconformance Reports. The following FOP categories are most relevant to data quality:

• Field Instrument Calibration and Maintenance

ROHM AND HAAS CO. FACILITY INVESTIGATION REPORT REVISION: 00, JUNE 2002 APPENDIX D

PAGE 5 OF 11

- Soil Sampling
- Groundwater Sampling
- Surface Water and Sediment Sampling
- Decontamination
- Documentation Requirements for Drilling and Well Installation
- Sampling, Labeling, Storage, and Shipment

Two QA/QC Field Audits were performed by Geomatrix QA auditors to verify that procedures required by the QAPP were being followed. QA/QC Field Audits were conducted on May 7 and 8, 2001 and from November 9 to 11, 2001. Although neither audit identified any significant breach in conformance to the FOPs, the audits did result in the implementation of real-time enhancements to the FI field program. Specifically, the QA auditor recommended improvements to sample chain-of-custody documentation procedures, sample shipment logistics, sample security and labeling practices, and quality assurance sampling frequency. Copies of QA/QC Field Audit Reports, originally submitted to the USEPA with Quarterly Progress Reports, have been included with this Appendix.

ROHM AND HAAS CO.
FACILITY INVESTIGATION REPORT
REVISION: 00, JUNE 2002
APPENDIX D
PAGE 6 OF 11

D.2.5 DOCUMENTATION

Documentation of field activities was performed throughout the duration of the fieldwork. Field personnel regularly maintained the following documentation:

- Daily Field Record Logs summarizing all field activities
- Daily Health and Safety Meeting Records
- Sample Control Logs
- Chain-of-Custody Records and associated Federal Express Air Bills
- Well Sampling and/or Development Records
- Sample Collection Records

Documentation procedures were reviewed and enhanced during the field audits by the QA Auditors, as described in Section D.2.4.

D.3.0 LABORATORY QUALITY CONTROL

D.3.1 GEOTECHNICAL ANALYSIS

The standard methods used for geotechnical analyses are widely recognized and are published by the American Society for Testing and Materials (ASTM) (see Section A3.1 of the QAPP). Laboratory precision for geotechnical parameters is assessed through the strict adherence to ASTM protocols and other applicable standards or guidelines for each parameter. No deviations from the standardized methods by the laboratory were identified or reported.

D.3.2 LABORATORY ANALYTICAL PROCEDURES

STL performed analytical procedures in accordance with the QAPP and as specified in the "Severn Trent Laboratory Quality Manual and Standard Operating Procedures" (STL, 2000). There were no significant deviations from the Data Quality Objectives (DQOs) as presented in the QAPP. All analytical data were provided in electronic format to Geomatrix by STL. These data were electronically transferred to a Geomatrix database to avoid potential errors from manual transcription.

D.3.3 DATA VALIDATION

Laboratory analytical data validation was performed in accordance with Section A9.2.2, *Procedures Used to Validate Laboratory Data* of the QAPP as set forth in the FI Work Plan (Geomatrix, 2000b). The third party validator, Environmental Standards, validated at least ten percent of the analytical data for each sample matrix. Data reports were selected for validation by Geomatrix to ensure that representative sets of environmental media were evaluated from the different phases of sampling. Validation of the analytical data included an assessment of data precision and accuracy. The following is a list of the typical data quality parameters that were examined:

- Holding Times
- Surrogate Recoveries (accuracy)

APPENDIX D PAGE 8 OF 11

Matrix Spike/Matrix Spike Duplicates for organics and Duplicates for inorganics (precision)

- Calibration
- Blanks
- Instrument Performance Checks
- Internal Standards
- Compound Identification
- Compound Quantitation and Reported Detection Limits
- System Performance

Environmental Standards performed a comprehensive review and generated three separate validation reports, entitled:

- Quality Assurance Review of Samples Collected on March 11, 13 and 14, 2001
- Quality Assurance Review of Samples Collected on May 8, 2001
- Quality Assurance Review of Samples Collected on November 8, 9, and 10, 2001

Copies of the written summary from each report are included with this Appendix; complete copies of the Data Validation Reports are maintained in the project files.

In general, data reviewed were considered to be valid and useable with appropriate qualifiers. Environmental Standards deemed that STL had provided sufficient quality control summary forms and supporting raw data to allow for complete validation of the data. Mostly minor and correctable deficiencies were noted during the data review. In response to a review of data deemed unreliable by Environmental Standards, the STL Quality Assurance (QA) Manager submitted an additional technical explanation in a

ROHM AND HAAS CO. FACILITY INVESTIGATION REPORT REVISION: 00, JUNE 2002 APPENDIX D PAGE 9 OF 11

letter dated April 19, 2002. In general, Environmental Standards designated a small number of non-detect results as unreliable. STL's QA Manager disagreed with these designations on the basis of STL's use of SW846 procedures – not CLP procedures – and on the laboratory's own conclusions using aggressive re-extraction practices and review of other laboratory control samples. A copy of STL correspondence is included with this Appendix. The outcome of the Environmental Standards validation and the STL review did not add any new chemical detections to the original data set, and the project data are considered to be valid and usable with the appropriate qualifiers.

D.4.0 PROJECT COMPLETENESS ASSESSMENT

Data completeness is a measurement of the amount of valid data obtained from a prescribed measurement system, as compared to that expected and required to meet the project goals. More specifically, completeness is defined as the percentage of valid results, based on the actual vs. proposed number of samples. The QAPP goal for data completeness for field and laboratory measurements is 90 percent.

D.4.1 FIELD MEASURED PARAMETERS

Table A1-4 of the QAPP summarizes the project Field Parameters. Completeness of field measured parameters is determined by assessing the quality and adequacy of data collected during the FI. As stated above, field equipment was calibrated on a daily basis and all field calibration measurements met project goals. Groundwater samples collected from monitoring wells that were micro-purged were field analyzed for dissolved oxygen, pH, specific conductance, and temperature. For monitoring wells that were bailed, however, these field parameters were not collected. Furthermore, the exact accuracy of groundwater pH measurements is in question, as described in Nonconformance Log 018. Because field parameters were not measured for some samples and due to the suspected problems with the pH meter, the completeness objective of 90 percent for the groundwater field parameters was not achieved. It is estimated that the completeness for the groundwater field measurements is 75 percent.

The soil samples, however, were field screened as planned with an organic vapor meter, and the completeness of this field parameter is 100 percent.

D.4.2 ANALYTICAL DATA

Completeness of analytical data is determined by comparing the number of valid samples collected and analyzed to the number of possible or planned samples. The FI was performed in a phased approach, with the addition of new sample locations and sample analyses on an ongoing basis. As noted in the variance logs, these additional samples added to the overall data set proposed in the FI Work Plan. All of the soil, sediment,

ROHM AND HAAS CO.
FACILITY INVESTIGATION REPORT
REVISION: 00, JUNE 2002
APPENDIX D
PAGE 11 OF 11

seeps, and groundwater samples that were collected were analyzed by STL. STL analyzed each sample for the specified target analyte list requested, including geochemical and geotechnical parameters. The results were determined to be valid and a completeness of 100 percent was achieved for the all matrices sampled during the FI.

Table D-1 Duplicate Soil and Sediment Samples Volatile Organic Detections

Morton International, Inc.
Reading, Ohio
Units: mg/kg

			_					Chits.							_			_	
Sample Location	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethene (total)	2-Butanone	Acetone	Acrylonitrile	Benzene	Bromodichloromethane	Carbon disulfide	Chlorobenzene	Chloroform	Chloromethane	cis-1,2-Dichloroethene	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Iodomethane	Isopropylbenzene
DP10-10'	7/27/2001	< 0.27	< 0.27	<0.27	0.17 J B	<1.1	<5.3	<0.27	< 0.27	0.18 J	< 0.27	< 0.27	< 0.27	< 0.13	NA	< 0.27	0.13 J	<0.27	NA
DP10-10' (Dup)	7/27/2001	<0.27	<0.27	<0.27	0.17 J B	<1.1	<5.3	<0.27	<0.27	0.095 J	<0.27	< 0.27	< 0.27	< 0.13	NA	< 0.27	0.084 J	< 0.27	NA
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.82	0.00	0.00	0.00	0.00	NA	0.00	42.99	0.00	NA
DP25-2.5'	8/7/2001	< 0.0053	< 0.0053	< 0.0053	< 0.021	0.0045 J	NA	<0.0053	< 0.0053	< 0.0053	< 0.0053	< 0.0053	< 0.011	< 0.0027	< 0.011	< 0.0053	< 0.0053	NA	< 0.0053
DP25-2.5' (Dup)	8/7/2001	< 0.0047	< 0.0047	< 0.0047	< 0.019	0.0032 J	NA	< 0.0047	< 0.0047	< 0.0047	< 0.0047	< 0.0047	< 0.0094	< 0.0024	< 0.0094	< 0.0047	< 0.0047	NA	< 0.0047
RPD		0.00	0.00	0.00	0.00	33.77	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
STR04-17.5'	3/19/2001	< 0.0052	< 0.0052	< 0.0052	< 0.021	0.0076 J	NA	< 0.0052	< 0.0052	< 0.0052	< 0.0052	< 0.0052	< 0.01	< 0.0026	< 0.01	< 0.0052	< 0.0052	NA	< 0.0052
STR04-17.5' (Dup)	3/19/2001	< 0.0046	<0.0046	< 0.0046	< 0.019	<0.019	NA	<0.0046	< 0.0046	< 0.0046	<0.0046	< 0.0046	< 0.0093	< 0.0023	< 0.0093	< 0.0046	< 0.0046	NA	< 0.0046
RPD		0.00	0.00	0.00	0.00	85.71	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
STR08-13'	3/26/2001	<0.24	<0.24	< 0.24	< 0.96	3.2	NA	<0.24	<0.24	0.38	<0.24	< 0.24	<0.48	<0.12	<0.48	<0.24	<0.24	NA	< 0.24
STR08-13' (Dup)	3/26/2001	<0.23	<0.23	<0.23	<0.94	5.9	NA	<0.23	<0.23	0.29	0.079 J	< 0.23	<0.47	<0.12	<0.47	<0.23	<0.23	NA	<0.23
RPD		0.00	0.00	0.00	0.00	59.34	NA	0.00	0.00	26.87	100.94	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
STR11-9'	8/20/2001	<0.0045	< 0.0045	< 0.0045	< 0.018	< 0.018	NA	< 0.0045	< 0.0045	< 0.0045	< 0.0045	< 0.0045	<0.0089	< 0.0022	<0.0089	< 0.0045	< 0.0045	NA	< 0.0045
STR11-9' (Dup)	8/20/2001	< 0.0047	< 0.0047	< 0.0047	< 0.019	<0.019	NA	< 0.0047	< 0.0047	< 0.0047	< 0.0047	< 0.0047	< 0.0093	< 0.0023	< 0.0093	<0.0047	<0.0047	NA	< 0.0047
RPD		0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
UAW15-20-2'	4/9/2001	< 0.0043	< 0.0043	< 0.0043	0.008 J	0.028	NA	< 0.0043	< 0.0043	< 0.0043	< 0.0043	< 0.0043	<0.0086	<0.0022	<0.0086	< 0.0043	< 0.0043	NA	< 0.0043
UAW15-20-2' (Dup)	4/9/2001	<0.0046	< 0.0046	< 0.0046	0.019	0.075	NA	<0.0046	< 0.0046	< 0.0046	<0.0046	< 0.0046	<0.0093	<0.0023	<0.0093	< 0.0046	<0.0046	NA	< 0.0046
RPD		0.00	0.00	0.00	81.48	91.26	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
B04-1.5'	10/9/2001	< 0.0054	< 0.0054	< 0.0054	<0.022	0.0044 J B	NA	< 0.0054	< 0.0054	< 0.0054	<0.0054	< 0.0054	<0.011	< 0.0027	<0.011	<0.0054	<0.0054	NA	< 0.0054
B04-1.5' (Dup)	10/9/2001	< 0.0055	< 0.0055	< 0.0055	< 0.022	0.005 JB	NA	<0.0055	< 0.0055	<0.0055	<0.0055	< 0.0055	< 0.011	< 0.0027	<0.011	< 0.0055	< 0.0055	NA	< 0.0055
RPD		0.00	0.00	0.00	0.00	12.77	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
SS-5 ~25' South	10/11/2001	< 0.0057	< 0.0057	NA	NA	0.0083 J	NA	< 0.0057	< 0.0057	< 0.0057	0.0043 J	< 0.0057	NA	NA	NA	< 0.0057	< 0.0057	NA	NA
SS-5 (Dup).	10/11/2001	< 0.0059	< 0.0059	NA	NA	0.0067 J	NA	<0.0059	< 0.0059	< 0.0059	0.0037 J	< 0.0059	NA	NA	NA	<0.0059	<0.0059	NA	NA
RPD		0.00	0.00	NA	NA	21.33	NA	0.00	0.00	0.00	15.00	0.00	NA	NA	NA	0.00	0.00	NA	NA
CS7 (Dup)	3/6/2002	< 0.0059	< 0.0059	NA	NA	<0.024	NA	< 0.0059	< 0.0059	< 0.0059	<0.0059	<0.0059	NA	NA	NA	< 0.0059	<0.0059	NA	NA
CS7	3/6/2002	<0.0055	< 0.0055	NA	NA	<0.022	NA	<0.0055	< 0.0055	< 0.0055	<0.0055	<0.0055	NA	NA	NA	< 0.0055	< 0.0055	NA	NA
RPD		0.00	0.00	NA	NA	0.00	NA	0.00	0.00	0.00	0.00	0.00	NA	NA	NA	0.00	0.00	NA	NA

Table D-1 Duplicate Soil and Sediment Samples Volatile Organic Detections

Morton International, Inc.
Reading, Ohio
Units: mg/kg

Sample Location	Sample Date	Methyl acetate	Methylcyclohexane	Methylene chloride	Tetrachloroethene	Toluene	Trichloroethene	Vinyl chloride	Xylenes (total)
DP10-10'	7/27/2001	NA	NA	<0.27	< 0.27	2.4	<0.27	< 0.27	0.32 J
DP10-10' (Dup)	7/27/2001	NA	NA	<0.27	<0.27	3.8	< 0.27	<0.27	0.2 J
RPD	*	NA	NA	0.00	0.00	45.16	0.00	0.00	46.15
DP25-2.5'	8/7/2001	< 0.011	< 0.011	< 0.0053	< 0.0053	< 0.0053	< 0.0053	< 0.011	<0.011
DP25-2.5' (Dup)	8/7/2001	< 0.0094	< 0.0094	< 0.0047	< 0.0047	< 0.0047	< 0.0047	< 0.0094	< 0.0094
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STR04-17.5'	3/19/2001	< 0.01	< 0.01	< 0.0052	< 0.0052	< 0.0052	< 0.0052	<0.01	< 0.01
STR04-17.5' (Dup)	3/19/2001	< 0.0093	< 0.0093	< 0.0046	< 0.0046	< 0.0046	< 0.0046	< 0.0093	< 0.0093
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STR08-13'	3/26/2001	<0.48	<0.48	<0.24	< 0.24	< 0.24	< 0.24	<0.48	<0.48
STR08-13' (Dup)	3/26/2001	<0.47	< 0.47	< 0.23	<0.23	<0.23	< 0.23	<0.47	< 0.47
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STR11-9'	8/20/2001	<0.0089	< 0.0089	< 0.0045	< 0.0045	< 0.0045	< 0.0045	< 0.0089	< 0.0089
STR11-9' (Dup)	8/20/2001	< 0.0093	< 0.0093	< 0.0047	0.0016 J	< 0.0047	< 0.0047	< 0.0093	< 0.0093
RPD		0.00	0.00	0.00	95.08	0.00	0.00	0.00	0.00
UAW15-20-2'	4/9/2001	<0.0086	< 0.0086	< 0.0043	< 0.0043	< 0.0043	< 0.0043	<0.0086	<0.0086
UAW15-20-2' (Dup)	4/9/2001	< 0.0093	< 0.0093	< 0.0046	< 0.0046	< 0.0046	< 0.0046	< 0.0093	< 0.0093
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B04-1.5'	10/9/2001	< 0.011	< 0.011	< 0.0054	< 0.0054	< 0.0054	< 0.0054	<0.011	< 0.011
B04-1.5' (Dup)	10/9/2001	< 0.011	< 0.011	< 0.0055	< 0.0055	< 0.0055	< 0.0055	< 0.011	< 0.011
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SS-5 ~25' South	10/11/2001	NA	< 0.011	< 0.0057	NA	< 0.0057	NA	NA	<0.011
SS-5 (Dup).	10/11/2001	NA	0.0011 J	< 0.0059	NA	< 0.0059	NA	NA	<0.012
RPD		NA	163.64	0.00	NA	0.00	NA	NA	0.00
CS7 (Dup)	3/6/2002	NA	< 0.012	< 0.0059	NA	< 0.0059	NA	NA	< 0.012
CS7	3/6/2002	NA	< 0.011	< 0.0055	NA	< 0.0055	NA	NA	<0.011
RPD		NA	0.00	0.00	NA	0.00	NA	NA	0.00

Notes:

RPD = Relative Percent Difference.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

Page 2 of 2

J = Estimated result; result is less than reporting limit.

B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NA indicates chemical was not on the target analyte list for that sample.

Table D-2 **Duplicate Soil and Sediment Samples**

Semivolatile Organic Detections Morton International, Inc.

Reading, Ohio Units: mg/kg

ois(2-Ethylhexyl) phthalat ndeno(1,2,3-cd)pyrene 2-Methylnaphthalene 1,3-Dichlorobenzene Di-n-octyl phthalate 3-Methylphenol 4-Methylphenol Fluoranthene Anthracene Phenol Sample Date Sample Location DP10-10' <1.5 <1.5 <1.5 7/27/2001 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 1.5 NA < 1.5 DP10-10' (Dup) <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 0.89 J NA <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 <1.5 7/27/2001 <1.5 <1.5 <1.5 RPD 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 51.05 NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 <0.41 <0.41 <0.41 <0.41 <0.41 NA <0.41 <0.41 <0.41 DP25-2.5' 8/7/2001 < 0.41 NA < 0.41 < 0.41 < 0.41 <0.41 <0.41 < 0.41 < 0.41 < 0.41 <0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 < 0.41 DP25-2.5' (Dup) < 0.37 < 0.37 <0.37 <0.37 <0.37 <0.37 NA <0.37 <0.37 <0.37 NA < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 | < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 8/7/2001 0.00 RPD STR04-17.5' 3/19/2001 <0.4 <0.4 <0.4 <0.4 <0.4 <0.4 NA < 0.4 <0.4 <0.4 NA < 0.4 < 0.4 < 0.4 < 0.4 <0.4 < 0.4 < 0.4 < 0.4 < 0.4 <0.4 <0.4 <0.4 < 0.4 <0.4 <0.4 < 0.4 < 0.4 <0.4 <0.4 <0.36 <0.36 <0.36 <0.36 NA <0.36 <0.36 <0.36 < 0.36 <0.36 <0.36 NA < 0.36 < 0.36 < 0.36 < 0.36 <0.36 <0.36 0.18 J < 0.36 <0.36 <0.36 <0.36 < 0.36 <0.36 <0.36 <0.36 < 0.36 < 0.36 < 0.36 STR04-17.5' (Dup) 3/19/2001 0.00 0.00 0.00 55.17 0.00 RPD 0.00 <0.37 <0.37 <0.37 <0.37 <0.37 <0.37 <0.37 < 0.37 STR08-13' 3/26/2001 0.34 J < 0.37 <0.37 <0.37 <0.37 <0.37 NA <0.37 <0.37 <0.37 NA < 0.37 < 0.37 <0.37 | <0.37 | <0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 0.31 J <0.38 <0.38 <0.38 <0.38 <0.38 NA <0.38 <0.38 <0.38 NA < 0.38 < 0.38 <0.38 < 0.38 <0.38 <0.38 <0.38 <0.38 < 0.38 <0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 < 0.38 STR08-13' (Dup) 3/26/2001 RPD 9.23 0.00 0.00 0.00 0.00 0.00 NA 0.00 0.00 | 0.00 NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 < 0.39 < 0.39 < 0.39 < 0.39 <0.39 <0.39 NA <0.39 <0.39 <0.39 < 0.39 < 0.39 <0.39 <0.39 <0.39 < 0.39 STR11-9' 8/20/2001 NA < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 8/20/2001 <0.39 <0.39 <0.39 <0.39 <0.39 NA <0.39 <0.39 <0.39 NA < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 | < 0.39 | < 0.39 < 0.39 < 0.39 <0.39 <0.39 <0.39 <0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 < 0.39 STR11-9' (Dup) 0.00 0.00 RPD 0.00 0.00 0.00 0.00 0.00 NA 0.00 | 0.00 NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 < 0.37 < 0.37 < 0.37 < 0.37 UAW15-20-2' < 0.37 < 0.37 < 0.37 < 0.37 <0.37 <0.37 NA < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 < 0.37 4/9/2001 NA < 0.37 < 0.37 < 0.37 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 <0.36 NA <0.36 <0.36 <0.36 NA < 0.36 < 0.36 < 0.36 <0.36 <0.36 <0.36 <0.36 UAW15-20-2' (Dup) 4/9/2001 < 0.36 < 0.36 < 0.36 < 0.36 RPD 0.00 NA 0.00 0.00 NA 0.00 <0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0 B04-1.5' < 0.35 < 0.35 <0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 < 0.35 10/9/2001 < 0.35 | < 0.35 | < 0.35 <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 | <0.35 0.1 J 0.072 J <0.35 <0.35 <0.35 0.082 J <0.35 <0.35 <0.35 0.15 J <0.35 <0.35 <0.35 0.096 J B04-1.5' (Dup) 10/9/2001 <0.35 0.14 J RPD 0.00 0.00 0.00 0.00 0.00 0.00 NA 0.00 0.00 0.00 0.00 0.00 138.98 128.64 111.11 131.75 0.00 141.46 0.00 124.07 0.00 0.00 0.00 80.00 0.00 0.00 0.00 113.90 0.00 | 85.71 SS-5 ~25' South NA <0.41 NA NA <0.41 NA <0.41 NA < 0.41 NA NA NA NA NA NA 10/11/2001 0.17 J NA
Notes:

NA

NA

NA

NA

NA

16.22

0.00

< 0.41

0.00

< 0.4

0.00

<0.41 NA

NA

NA

NA

NA

NA

NA

NA

NA

<0.41 NA

NA <0.4 NA <0.4

NA

<0.41 NA <0.41

NA

0.00

0.00

< 0.41

0.00

0.00

NA

NA

NA

NA

NA

NA NA <0.41

NA

NA NA

< 0.41

0.00

< 0.4

0.00

NA

10/11/2001 0.2 J

3/6/2002 < 0.41

3/6/2002 < 0.4

RPD = Relative Percent Difference.

J = Estimated result; result is less than reporting limit.

= Co-Elution of 3-Methylphenol and 4-Methylphenol.

NA indicates chemical was not on the target analyte list for that sample.

NA

NA NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

NA

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

SS-5 (Dup).

CS7(Dup)

RPD

CS7

RPD

Table D-3 Duplicate Soil and Sediment Samples Pesticides and PCB Detections

Morton International, Inc. Reading, Ohio

Units: mg/kg

			<u> </u>	1			r				· ·	1		T		1 63			 				
Sample Location	Sample Date	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-Chlordane	beta-BHC	Chlorobenzilate	Dieldrin	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-Chlordane	Heptachlor epoxide	Isodrin	Methoxychlor	Aroclor 1016	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
DP10-10'	7/27/2001	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.38	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	<0.2	<0.38	<0.38	<3.8	<3.8	<3.8	<3.8	<3.8
DP10-10' (Dup)	7/27/2001	< 0.0039	<0.0039	< 0.0039	< 0.0039	NA	0.0038 J	< 0.0075	< 0.0039	< 0.0039	< 0.0039	< 0.0039	< 0.0039	NA	NA	< 0.0039	< 0.0075	< 0.0075	< 0.38	< 0.38	<0.38	<0.38	<0.38
RPD		0.00	0.00	0.00	0.00	NA	192.54	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DP25-2.5'	8/7/2001	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	NA	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	NA	<0.0041	< 0.041	<0.041	< 0.041	< 0.041	< 0.041
DP25-2.5' (Dup)	8/7/2001	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	NA	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	NA	< 0.0037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00
STR04-17.5'	3/19/2001	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	NA	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	NA	< 0.004	< 0.04	< 0.04	< 0.04	< 0.04	<0.04
STR04-17.5' (Dup)	3/19/2001	< 0.0019	<0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	NA	< 0.0019	<0.0019	< 0.0019	<0.0019	< 0.0019	< 0.0019	< 0.0019	< 0.0019	NA	< 0.0036	< 0.036	< 0.036	< 0.036	< 0.036	< 0.036
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00
STR08-13'	3/26/2001	< 0.019	< 0.019	< 0.019	<0.019	< 0.019	<0.019	NA	< 0.019	<0.019	< 0.019	< 0.019	<0.019	< 0.019	< 0.019	<0.019	NA	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
STR08-13' (Dup)	3/26/2001	< 0.039	< 0.039	< 0.039	< 0.039	< 0.039	<0.039	NA	< 0.039	<0.039	< 0.039	< 0.039	< 0.039	<0.039	< 0.039	<0.039	NA	< 0.075	< 0.038	<0.038	< 0.038	< 0.038	< 0.038
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00
STR11-9'	8/20/2001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	NA	< 0.002	< 0.002	< 0.002	< 0.002	<0.002	< 0.002	< 0.002	< 0.002	NA	<0.0039	< 0.039	< 0.039	< 0.039	< 0.039	< 0.039
STR11-9' (Dup)	8/20/2001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	NA	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	<0.002	< 0.002	<0.002	NA	<0.0039	< 0.039	< 0.039	< 0.039	< 0.039	< 0.039
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00
UAW15-20-2'	4/9/2001	< 0.0038	<0.0038	<0.0038	<0.0038	< 0.0038	<0.0038	NA	<0.0038	<0.0038	<0.0038	<0.0038	< 0.0038	<0.0038	< 0.0038	< 0.0038	NA	<0.0073	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
UAW15-20-2' (Dup)	4/9/2001	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	NA	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	< 0.0037	NA	<0.0073	< 0.036	< 0.036	< 0.036	< 0.036	< 0.036
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00
B04-1.5'	10/9/2001	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	NA	< 0.0036	<0.0036	< 0.0036	< 0.0036	< 0.0036	<0.0036	< 0.0036	< 0.0036		< 0.0071	< 0.035		< 0.035	< 0.035	< 0.035
B04-1.5' (Dup)	10/9/2001	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	<0.0036	NA	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0036	< 0.0071	< 0.0071	< 0.035	< 0.035	< 0.035	< 0.035	< 0.035
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SS-5 ~25' South	10/11/2001	< 0.021	<0.021	< 0.021	< 0.021	< 0.021	<0.021	NA	< 0.021	< 0.021	NA	<0.021	< 0.021	<0.021	NA	<0.021	< 0.041	NA	NA	NA	NA	NA	NA
SS-5 (Dup)	10/11/2001	< 0.021	<0.021	<0.021	<0.021	< 0.021	<0.021	NA	< 0.021	< 0.021	NA	< 0.021	<0.021	<0.021	NA	<0.021	< 0.041	NA	NA	NA	NA	NA	NA
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	NA	0.00	0.00	0.00	NA	0.00	0.00	NA	NA	NA	NA	NA	NA
CS7	3/6/2002	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	NA	<0.0021	< 0.0021	NA	< 0.0021	< 0.0021	< 0.0021	NA	< 0.0021	< 0.0041	NA	NA	NA	NA	NA	NA
CS7(Dup)	3/6/2002	< 0.0021	<0.0021	< 0.0021	< 0.0021	< 0.0021	<0.0021	NA	<0.0021	<0.0021	NA	< 0.0021	< 0.0021	<0.0021	NA	< 0.0021	< 0.004	NA	NA	NA	NA	NA	NA
RPD		0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	NA	0.00	0.00	0.00	NA	0.00	0.00	NA	NA	NA	NA	NA	NA

Notes:

RPD = Relative Percent Difference.

J = Estimated result; result is less than reporting limit.

PG = The percentage difference between the original and confirmation analyses is greater than 40%.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

Table D-4

Duplicate Soil and Sediment Samples Inorganic Chemical Detections

Morton International, Inc.

rton International, In Reading, Ohio

Units: mg/kg

													us: m	8'8														
	Sample Date	Acid-insoluble Sulfide	Acid-Soluble Sulfide	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide, Total	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Tin	Vanadium	Zinc
DP10-10'	7/27/2001	NA	1400	NA		0.74 B	13.9 B	0.091 B	0.25	NA	7.9	3.7 B	5.3	< 0.58	NA	2.9	NA	NA	0.09 B	7.8	NA	< 0.58	<0.58	NA	<1.2	531	5.7 B	100
DP10-10' (Dup)	7/27/2001	NA	820	NA	<1.1	1.2	8.2 B	0.1 B	0.18 B	NA	6.9	3.4 B		0.25 B	NA	2.7	NA	NA	0.046 B	7.8	NA	< 0.57	<0.57	NA	<1.1	273	6.5	49.1
RPD		NA	52.25	NA	0.00	47.42	51.58	9.42	32.56	NA	13.51	8.45	24.79	79.52	NA	7.14	NA	NA	64.71	0.00	NA	0.00	0.00	NA	0.00	64.18	13.11	68.28
DP25-2.5'	8/7/2001	NA	<62	14100	<1.2	8.8	100	0.55 B	6.5	2690	15	7.6		< 0.62	20100	10.2	2290	297	0.024 B	15.4		0.53 B	***************************************	574 B	1.5	NA	25.8	54.6
DP25-2.5' (Dup)	8/7/2001	NA	<56	6530	<1.1	6.1	49.4	0.27 B	0.33	110000	9.6	6.3	13.9	0.56	15900	6.9	27900	404	<0.11	15.8	1160	0.66	< 0.56	428 B	2.7	NA	12.2	39.9
RPD		NA	0.00	73.39	0.00	36.24	67.74	68.29	180.67	190.45	43.90	18.71	15.28	10.17	23.33	38.60	169.66	30.53	128.36	2.56	26.34	21.85	0.00	29.14	57.14	NA	71.58	31.11
DP40-6' (Dup)	3/5/2002	NA	NA	6070 J	<1.1	2.7	39.4	0.31 B	0.13 B	39000 J	8.1	5.1 B	8.2		11400	6.3	18300	277	0.016 B		518 B J		NA	63.3 B	1.4	3.7 B J	10.3	31
DP40-6'	3/5/2002	NA	NA	5670 J	<1.1	4.8	37	0.35 B	0.2 B	83500 J	9.2	5 B	7.7	NA	14500	6.4	40500	301	0.035 B	8.9	583 J	< 0.57	NA	103 B	1.2	4 B J	15.1	29
RPD		NA	NA	6.81	0.00	56.00	6.28	12.12	42.42	72.65	12.72	1.98	6.29	NA	23.94	1.57	75.51	8.30	74.51	2.22	11.81	0.00	NA	47.75	15.38	7.79	37.80	6.67
STR04-17.5'	3/19/2001	760	NA	2780	<1.2		12.8 B	< 0.61	0.13 B	119000	4.8	2.7 B	8.1	< 0.61	7050	5.6	26200	259	0.026 B	7	661	< 0.61	<0.61	202 B	0.98 B	NA	8.8	28.4
STR04-17.5' (Dup)	3/19/2001	550	NA	1750	<1.1	2.6	11.9 B	0.077 B	0.16 B	162000	5.2	2.6 B	7.7	0.21 B	7110	5.1	38800	318	<0.11	6.6	334 B	< 0.54	< 0.54	258 B	0.83 B	NA	6.7	41.1
" 'D		32.06	NA	45.47	0.00	14.29	7.29	155.17	20.69	30.60	8.00	3.77	5.06	97.56	0.85	9.35	38.77	20.45	123.53	5.88	65.73	0.00	0.00	24.35	16.57	NA	27.10	36.55
STR08-13'	3/26/2001	280	NA	4460	<1.1	4.2	34.6	0.13 B	0.063 B	150000	9.4 L	5.2 B	9.7	< 0.56	13400	5.9 L	41700	587	<0.11	10.5 L		< 0.56	<0.56	311 B	2.6	NA	10.9	38.8 MBD
STR08-13' (Dup)	3/26/2001	290	NA	3360	<1.1	3.5	25.9	0.12 B	<0.23	146000	6.8	3.5 B	6.5	0.29 B	9380	4.3	24200	414	<0.11	7.8	1020	< 0.57	<0.57	240 B	1.5	NA	7.4	25.3 MBD
RPD		3.51	NA	28.13	0.00	18.18	28.76	8.00	113.99	2.70	32.10	39.08	39.51	63.53	35.29	31.37	53.11	34.57	NA	29.51	0.99	0.00	0.00	25.77	53.66	NA	38.25	42.12
STR11-9'	8/20/2001	NA	<120	10200	<1.2	19.4	54.7	0.51 B	0.15 B	35400	15	14.8	23.9	<0.59	36200	12.1	12600		0.012 B	36.1		0.57 B		<586	<1.2	NA	20.9	79.1
STR11-9' (Dup)	8/20/2001	NA	<120	10200	<1.2	11.8	56.9	0.57 B	0.29	54500	14.4	10	21.4	< 0.59	25300	13.1	14400	279	<0.12	28.4	1960	0.42 B	<0.59	72.5 B	<1.2	NA	21.5	65
RPD		NA	0.00	0.00	0.00	48.72	3.94	11.11	63.64	42.49	4.08	38.71	11.04	0.00	35.45	7.94	13.33	12.75	163.64	23.88	3.64	30.30	0.00	155.96	0.00	NA	2.83	19.57
UAW15-20-2'	4/9/2001	26 B	NA	5910	<1.1	5.5	45.8	0.21 B	0.093 B	1530	7.5	5.8	9.7	< 0.55	10400 MBB	13	1120	257	0.016 B	9.7	576	0.56	0.9	470 B	<1.1	NA	16	36
UAW15-20-2' (Dup)	4/9/2001	<55	NA	5940	<1.1	6.2	55.1	0.21 B	0.093 B	4310	7.6	5.8	10.3	< 0.55	11400 MBB	11.2	1210	530	0.017 B	9.9	594	0.58	1.9	483 B	0.94 B	NA	16.1	37.4
RPD		71.60	NA	0.51	0.00	11.97	18.43	0.00	0.00	95.21	1.32	0.00	6.00	0.00	9.17	14.88	7.73	69.38	6.06	2.04	3.08	3.51	71.43	2.73	15.69	NA	0.62	3.81
B04-1.5'	10/9/2001	NA	<54	1870	<1.1	4	9.8 B J	< 0.54	0.16 B	86600	3.7	2.8 B	7.3	<0.54	5760	4.1	31100	191 J	0.0098 B	6.5	368 B	< 0.54	<0.54	69.2 B	1.5	0.93 B J	6.2	22.3
B04-1.5' (Dup)	10/9/2001	NA	<53	2200	<1.1	3.7	11.4 B J	< 0.53	0.16 B	97000	3.7	2.9 B	6.8	< 0.53	5980	4.3	36200	198 J	<0.11	6.2	387 B	< 0.53	<0.53	66.6 B	1.2	0.97 B J	6.7	21.6
RPD		NA	0.00	16.22	0.00	7.79	15.09	0.00	0.00	11.33	0.00	3.51	7.09	0.00	3.75	4.76	15.16	3.60	167.28	4.72	5.03	0.00	0.00	3.83	22.22	4.21	7.75	3.19
SS-5 ~25' South	10/11/2001	NA	95	3370		3.9	37.2	0.18 B	0.27	65700		4.2 B		< 0.62	9740	12.5			<0.12		486 B		A STATE OF THE PARTY OF THE PAR	175 B	<1.2	4.9 B J	9.3	38.9
SS-5 (Dup)	10/11/2001	NA	100	3870	<1.2	3.8	30.4	0.21 B	0.23 B	67000		4.5 B		< 0.62	10400	14.1			0.011 B		529 B			196 B	<1.2	3.9 B J	10.4	46.7
RPD	Ŧ	NA	5.13	13.81	0.00	2.60	20.12	15.38	16.00	1.96	45.78	6.90		0.00	6.55	12.03	16.73	8.47	166.41				NA	11.32	0.00	22.73	11.17	18.22
CS7	3/6/2002	NA	NA	1690 J		3.3	16.8 B	0.12 B	0.16 B	114000 J		2.5 B		NA	7480		30100		0.028 B		290 B J	Commence in contract of the last		162 B	1.7	3.9 B J	6.6	29.9
CS7 (Dup)	3/6/2002	NA	NA	2160 J	<1.2	4.7	42.6	0.18 B	0.16 B	123000 J	6	3.3 B	4.4	NA	9920	7.5	37800		0.012 B		344 B J	Manager Committee		145 B	2	4 B J	9.3	24.8
RPD		NA	NA	24.42	0.00	35.00	86.87	40.00	0.00	7.59	6.90	27.59	10.75	NA	28.05	4.08	22.68	52.43	80.00	3.57	17.03	0.00	NA	11.07	16.22	2.53	33.96	18.65

Notes:

RPD = Relative Percent Difference.

MBB = This analyte is present at a reportable level in the associated method blank but is less than 5% of the sample amount.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

J = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B = Estimated result; result is less than reporting limit.

L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.

MBD = This analyte is present in the associated method blank at an amount that is less than two times the reporting limit.

Table D-5 Duplicate Groundwater Samples Volatile Organic Detections

Morton International, Inc. Reading, Ohio

Units: μg/L

			1 4		_																_										$\overline{}$
Sample Location	Sample Data	1,1,1-Trichloroethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	2-Butanone	4-Methyl-2-pentanone (MIBK)	Acetone	Benzene	Bromodichloromethane	Bromoform	Carbon disulfide	Chlorobenzene	Chloroform	cis-1,2-Dichloroethene	Cyclohexane	Dibromochloromethane	Dichlorodifluoromethane	Ethylbenzene	Isopropylbenzene	Methylcyclohexane	Methylene chloride	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl chloride	Xylenes (total)
UAW02-20	5/7/2001	<1	<1	<1	0.74 J	<1	0.42 J	<1	<10	<10	<10	0.49 J	<1	<1	<1	32	<1	< 0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	< 0.5	<1	<2	<1
UAW02-20 (Dup)	5/7/2001	<1.2	<1.2	<1.2	0.67 J	<1.2	0.44 J	<1.2	<12	NA	<12	0.47 J	<1.2	<1.2	<1.2	31	<1.2	<0.62	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	< 0.62	<1.2	<2.5	<1.2
RPD		0.00	0.00	0.00	9.93	0.00	4.65	0.00	0.00	NA	0.00	4.17	0.00	0.00	0.00	3.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UAW07-20	5/8/2001	<2	NA	<2	1.6 J	<2	<2	<2	<20	NA	<20	2.1	<2	<2	2.4	39	<2	<1	NA	<2	<4	4.4	NA	NA	<2	<2	3.5	<1	<2	<4	13
UAW07-20 (Dup)	5/8/2001	<2.5	NA	<2.5	1.5 J	<2.5	<2.5	<2.5	<25	NA	<25	1.8 J	<2.5	<2.5	1.1 J	38	<2.5	<1.2	NA	<2.5	<5	4.3	NA	NA	<2.5	<2.5	3.6	<1.2	<2.5	<5	13
RPD		0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	NA	0.00	15.38	0.00	0.00	74.29	2.60	0.00	0.00	NA	0.00	0.00	2.30	NA	NA	0.0	0.0	2.8	0.0	0.0	0.0	0.0
UAW16-10	10/12/2001	<120	<120	<120	<120	<120	<120	<120	<1200	NA	8000	<120	<120	<120	<120	23 J	<120	<62	<120	<120	<120	<120	<120	<120	<120	<120	<120	<62	<120	<250	<120
UAW16-10 (Dup)	10/12/2001	<100	<100	<100	<100	<100	<100	<100	<1000	NA	6500	<100	<100	<100	<100	24 J	<100	<50	<100	<100	<100	<100	<100	<100	<100	<100	<100	<50	<100	<200	<100
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	20.69	0.00	0.00	0.00	0.00	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UAW19-80	11/12/2001	0.25 J	<1	<1	4.8	0.29 J	33	1.3	<10	NA	1.3 J B	<1	<1	<1	<1	<1	12	1.3	<1	<1	<1	<1	<1	<1	<1	<1	0.36 J	<0.5	<1	<2	<1
UAW19-80 (Dup)	11/12/2001	13	<5	<5	9.8	<5	140	13	<50	NA	6.3 J B	<5	<5	<5	<5	3.3 J	3.7 J	13	<5	<5	<5	<5	<5	<5	<5	15	<5	<2.5	2.7 J	<10	<5
RPD		200.00	0.00	0.00	68.49	178.07	123.70	163.64	0.00	NA	131.58	0.00	0.00	0.00	0.00	106.98	105.73	163.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175.00	173.13	0.00	91.89	0.00	0.00
UAW20-60	11/14/2001	94	4.5 J	4.2 J	52	10 J	310	95	<110	NA	7.8 J	<11	<11	<11	<11	<11	39	92	<11	<11	<11	<11	<11	<11	8 J B	20	<11	2.5 J	7 J	<22	<11
UAW20-60 (Dup)	11/14/2001	98	4.8 J	<11	58	11	320	100	<110	NA	<110	<11	<11	<11	<11	<11	41	99	<11	<11	<11	<11	<11	<11	7.8 J B	20	<11	1.8 J	7.9 J	<22	<11
RPD		4.17	6.45	89.47	10.91	9.52	3.17	5.13	0.00	NA	173.51	0.00	0.00	0.00	0.00	0.00	5.00	7.33	0.00	0.00	0.00	0.00	0.00	0.00	2.53	0.00	0.00	32.56	12.08	0.00	0.00
LAW05-150	3/16/2002	<20	NA	<20	25	<20	450	30	<200	<100	<200	<20	<20	<20	<20	<20	<20	26	NA	<20	<40	<20	NA	NA	<20	<20	<20	4 J	<20	<40	<20
LAW05-150 (Dup)	3/16/2002	<20	NA	<20	24	<20	450	30	<200	<100	<200	<20	<20	<20	<20	<20	<20	26	NA	<20	<40	<20	NA	NA	<20	<20	<20	4.6 J	<20	<40	<20
RPD		0.00	NA	0.00	4.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	NA	NA	0.00	0.00	0.00	13.95	0.00	0.00	0.00

Notes:

RPD = Relative Percent Difference.

J = Estimated result; result is less than reporting limit.

 $B = Method \ blank \ contamination.$ The associated method blank contains the target analyte at a reportable level.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

Table D-6 Duplicate Groundwater Samples Semivolatile Organic Detections

Morton International, Inc. Reading, Ohio

Units: µg/L

Sample Location	Sample Date	1,1'-Biphenyl	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dioxane	2,4-Dichlorophenol	2,4-Dimethylphenol	2-Chlorophenol	2-Methylphenol	4-Methylphenol	Acenaphthene	Aniline	Benzaldehyde	bis(2-Ethylhexyl) phthalate	Butyl benzyl phthalate	Caprolactam	Di-n-octyl phthalate	Dimethyl phthalate	Fluorene	Phenol
UAW02-20	5/7/2001	<10	<10	12	<10	3.7 J	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
UAW02-20 (Dup)	5/7/2001	<10	<10	11	<10	3.5 J	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
RPD		0.00	0.00	8.70	0.00	5.56	NA	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UAW07-20	5/8/2001	NA	<100	37 J	<100	<100	<100	<100	<100	<100	<100	<100	<100	150	NA	<100	<100	NA	<100	<100	<100	<100
UAW07-20 (Dup)	5/8/2001	NA	<25	34	<25	<25	<25	<25	<25	<25	<25	<25	<25	44	NA	<25	<25	NA	<25	<25	<25	<25
RPD		NA	0.00	8.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109.28	NA	0.00	0.00	NA	0.00	0.00	0.00	0.00
UAW16-10	10/12/2001	<10	<10	6.9 J	<10	12	NA	<10	<10	<10	<10	2.4 J#	<10	NA	<10	<10	<10	19	<10	<10	<10	<10
UAW16-10 (Dup)	10/12/2001	<10	<10	6.2 J	<10	11	NA	<10	<10	<10	<10	3.4 J#	<10	NA	<10	<10	<10	17	<10	<10	<10	<10
RPD		0.00	0.00	10.69	0.00	8.70	NA	0.00	0.00	0.00	0.00	34.48	0.00	NA	0.00	0.00	0.00	11.11	0.00	0.00	0.00	0.00
UAW19-80	11/12/2001	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
UAW19-80 (Dup)	11/12/2001	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
RPD		0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UAW20-60	11/14/2001	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
UAW20-60 (Dup)	11/14/2001	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
RPD		0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAW05-150	3/16/2002	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	NA	<10	<10	NA	<10	<10	<10	<10
LAW05-150 (Dup)	3/16/2002	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	NA	<10	<10	NA	<10	<10	<10	<10
RPD		NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	NA	0.00	0.00	0.00	0.00

Notes:

RPD = Relative Percent Difference.

B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples. See Appendix B for the complete target analyte lists.

J = Estimated result; result is less than reporting limit.

^{# =} Co-Elution of 3-Methylphenol and 4-Methylphenol.

Table D-7 Duplicate Groundwater Samples Pesticides and PCB Detections

Morton International, Inc.
Reading, Ohio

Units: μg/L

Sample Location	Sample Date	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	alpha-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Isodrin	Aroclor 1242
UAW02-20	5/7/2001	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	NA	<1
UAW02-20 (Dup)	5/7/2001	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	< 0.05	<0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA	<1
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
UAW07-20	5/8/2001	< 0.25	<0.25	< 0.25	<0.25	< 0.25	NA	< 0.25	< 0.25	<0.25	0.19 J	0.13 J	<0.25	< 0.25	NA	<0.25	< 0.25	< 0.25	< 0.5	<1
UAW07-20 (Dup)	5/8/2001	<0.5	<0.5	< 0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	0.35 J	NA	<0.5	<0.5	<0.5	<1	<10
RPD		0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	89.86	117.46	0.00	33.33	NA	0.00	0.00	0.00	0.00	0.00
UAW16-10	10/12/2001	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<25	<25	<25	<2.5	<2.5	<2.5	<2.5	<2.5	NA	130 J
UAW16-10 (Dup)	10/12/2001	<2.5	<10	<10	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	NA	<100
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	26.09
UAW19-80	11/12/2001	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	NA	<1
UAW19-80 (Dup)	11/12/2001	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	NA	<1
'D		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
∪AW20-60	11/14/2001	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA	<1
UAW20-60 (Dup)	11/14/2001	<0.25	< 0.25	< 0.25	<0.25	< 0.25	< 0.25	< 0.25	< 0.25	<0.25	< 0.25	< 0.25	<0.25	<0.25	< 0.25	<0.25	<0.25	< 0.25	NA	<1
RPD		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
LAW05-150	3/16/2002	< 0.05	< 0.05	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.1	<1
LAW05-150 (Dup)	3/16/2002	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	NA	<0.05	< 0.05	<0.05	< 0.05	< 0.05	<0.05	< 0.05	NA	<0.05	< 0.05	< 0.05	<0.1	<1
RPD		0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00

Notes:

RPD = Relative Percent Difference.

J = Estimated result; result is less than reporting limit.

PG = The percentage difference between the original and confirmation analyses is greater than 40%.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

Table D-8 Duplicate Groundwater Samples Inorganic Chemical Detections

Morton International, Inc.
Reading, Ohio

Units: µg/L

Sample Location	Sample Date	Aluminum	Aluminum-DISS	Antimony	Antimony-DISS	Arsenic	Arsenic-DISS	Barium	Barium-DISS	Beryllium	Beryllium-DISS	Cadmium	Cadmium-DISS	Calcium	Calcium-DISS	Chromium	Chromium-DISS	Cobalt	Cobalt-DISS	Copper	Copper-DISS	Cyanide, Total	Iron	Iron-DISS	Lead	Lead-DISS	Magnesium	Magnesium-DISS	Manganese	Manganese-DISS	Mercury	Mercury-DISS	Nickel	Nickel-DISS	Potassium
UAW02-20	5/7/2001	49.1 B		<10	NA	3.9 E	NA	400	NA	<5	NA	<2	NA	331000	316000	3.3 B	NA	<7	NA	CO. 107 26 11	NA	<10	4200	641	<3	NA	58700	59200	892	NA	< 0.2	NA	27.1 B	NA	6670
UAW02-20 (Dup)	5/7/2001	61.2 B	NA	<10	NA	6.1 E	NA	395	NA	<5	NA	<2	NA	316000	302000	22.6	NA	<7	NA	<25	NA	<10	4480	659	<3	NA	56200	53400	869	NA	<0.2	NA	47.2	NA	6600 L
RPD		21.94	NA	0.0	NA	44.00) NA	1.26	NA	0.0	NA	0.0	NA	4.64	4.53	149.03	NA NA	0.0	NA	0.0	NA	0.0	6.45	2.77	0.0	NA	4.35	10.30	2.61	NA	0.0	NA	54.10	NA	1.06
UAW07-20	5/8/2001	NA	NA	<10	NA	<10	NA	90.3 B	NA	<5	NA	<2	NA	466000	453000	1.6 B	NA	<7	NA	<25	NA	<10	270	<100	<3	NA	58000	57200	NA	NA	< 0.2	NA	2.5 B	NA	11500
UAW07-20 (Dup)	5/8/2001	NA	NA	<10	NA	4.6 B	NA	95.8 B	NA	<5	NA	0.32 E	NA	496000	479000	<5	NA	<7	NA	<25	NA	<10	303	<100	<3	NA	61600	60400	NA	NA	< 0.2	NA	2.3 B	NA	12100
RPD		NA	NA	0.0	NA	73.97	NA	5.91	NA	0.0	NA	144.83	NA	6.24	5.58	103.03	NA	0.0	NA	0.0	NA	0.0	11.52	0	0.0	NA	6.02	5.44	NA	NA	0.0	NA	8.33	NA	5.08
UAW16-10	10/12/2001	98.3 B	NA	<10	NA	24.9	NA	55.5 B	NA	<5	NA	<2	NA	223000	226000	7	NA	1.9 B	NA	<25	NA	<10	1300	1570	<3	NA	38900	39900	2760	NA	<0.2	NA	17.1 B	NA	7420 J
UAW16-10 (Dup)	10/12/2001	98.6 B	NA	<10	NA	23.2	NA	55.1 B	NA	<5	NA	<2	NA	221000	226000	6.9	NA	1.8 B	NA	<25	NA	<10	1250	1250	<3	NA	38200	39400	2740	NA	<0.2	NA	17.5 B	NA	7310 J
RPD		0.30	NA	0.0	NA	7.07	NA	0.72	NA	0.0	NA	0.0	NA	0.90	0.00	1.44	NA	5.41	NA	0.0	NA	0.0	3.92	22.70	0.0	NA	1.82	1.26	0.73	NA	0.0	NA	2.31	NA	1.49
UAW19-80	11/12/2001	1010 J	NA	<10	NA	<10	NA	113 B	NA	<5	NA	<2	NA	177000	186000	19.6	NA	1.4 B	NA	12.4 B	NA	<10	1700	<100	<3	NA	52700	55400	60.9	NA	<0.2	NA	14.1 B	NA	2020 B
UAW19-80 (Dup)	11/12/2001	65.4 B J	NA	<10	NA	<10	NA	25.4 B	NA	<5	NA	0.62 E	NA	358000	349000	11.8	NA	13.3	NA	12.1 B	NA	<10	<100	<100	<3	NA	81600	79200	1190	NA	<0.2	NA	66.3	NA	5960
RPD		175.67	NA	0.0	NA	0.0	NA	126.59	NA	0.0	NA	105.34	NA	67.66	60.93	49.68	NA	161.90	NA	2.45	NA	0.0	177.78	0.0	0.0	NA	43.04	35.36	180.53	NA	0.0	NA	129.85	NA	98.75
UAW20-60	11/14/2001	<200	NA	<10	NA	<10	NA	26.5 B	NA	<5	NA	0.3 B	NA	446000	430000	<5	NA	2.3 B	NA	5.8 B	NA	2.9 B	<100	<100	<3	NA	124000 J	120000 J	303	NA	< 0.2	NA	8.7 B	NA	3640 B
\W20-60 (Dup)	11/14/2001	70.6 B J	NA	2.8 B	NA	<10	NA	26.1 B	NA	<5	NA	0.33 E	NA	436000	431000	<5	NA	2.2 B	NA	5.3 B	NA	1.9 B	175	<100	<3	NA	123000 J	121000 J	303	NA	<0.2	NA	8.9 B	NA	3550 B L
, . D		95.64	NA	112.50	0 NA	0.0	NA	1.52	NA	0.0	NA	9.52	NA	2.27	0.23	0.0	NA	4.44	NA	9.01	NA	41.67	54.55	0.0	0.0	NA	0.81	0.83	0.0	NA	0.0	NA	2.27	NA	2.50
LAW05-150	3/16/2002	NA	NA	<10	NA	6.2 B	NA	94.3 B	NA	0.55 B	NA	<2	NA	NA	NA	<5	NA	<7	NA	<25	NA	<10	NA	NA	<3	NA	NA	NA	NA	NA	0.35	NA	<40	NA	NA
LAW05-150 (Dup)	3/16/2002	NA	NA	<10	NA	4.6 B	NA	94.7 B	NA	<5	NA	<2	NA	NA	NA	<5	NA	<7	NA	<25	NA	<10	NA	NA	<3	NA	NA	NA	NA	NA	0.16 B	NA	<40	NA	NA
RPD		NA	NA	0.0	NA	29.63	NA	0.42	NA	160.36	NA	0.0	NA	NA	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	NA	0.0	NA	NA	NA	NA	NA	74.51	NA	0.0	NA	NA

Table D-8 Duplicate Groundwater Samples Inorganic Chemical Detections

Morton International, Inc. Reading, Ohio

Units: µg/L

Sample Location	Sample Date	Potassium-DISS	Selenium	Selenium-DISS	Silver	Sodium	Sodium-DISS	Thallium	Thallium-DISS	Tin	Tin-DISS	Total Sulfide	Vanadium	Vanadium-DISS	Zinc	Zinc-DISS
UAW02-20	5/7/2001	6130	<5	NA	<5	496000	446000	7.2 B	NA	NA	NA	<1000	37.3	NA	<20	NA
UAW02-20 (Dup)	5/7/2001	6280 L	<5	NA	<5	475000	452000	8.5 B	NA	NA	NA	1800	39.2	NA	<20	NA
RPD		2.42	0.0	NA	0.0	4.33	1.34	16.56	NA	NA	NA	57.14	4.97	NA	0.0	NA
UAW07-20	5/8/2001	10800	<5	NA	<5	413000	397000	10.6	NA	866	NA	5800	3.2 B	NA	12.4 B	NA
UAW07-20 (Dup)	5/8/2001	11600	<5	NA	<5	432000	417000	8.3 B	NA	1010	NA	7500	3.9 B	NA	<20	NA
RPD		7.14	0.0	NA	0.0	4.50	4.91	24.34	NA	15.35	NA	25.56	19.72	NA	0.0	NA
UAW16-10	10/12/2001	7400 J	<5	NA	<5	277000	276000	5.5 B J	NA	NA	NA	3900	59.3	NA	<20	NA
UAW16-10 (Dup)	10/12/2001	7360 J	<5	NA	<5	275000	278000	8.6 B J	NA	NA	NA	6300	59.1	NA	<20	NA
RPD		0.54	0.0	NA	0.0	0.72	0.72	43.97	NA	NA	NA	47.06	0.34	NA	0.0	NA
UAW19-80	11/12/2001	1850 B	<5	NA	<5	58700	59400	10.3 J	NA	NA	NA	<1000	1 B	NA	<20	NA
UAW19-80 (Dup)	11/12/2001	5750	<5	NA	<5	261000	254000	8.2 B J	NA	NA	NA	<1000	<7	NA	<20	NA
RPD		102.63	0.0	NA	0.0	126.56	124.19	22.70	NA	NA	NA	0	150.00	NA	0.0	NA
UAW20-60	11/14/2001	3530 B	<5	NA	<5	139000	134000	13.8	NA	NA	NA	1600	<7	NA	<20	NA
W20-60 (Dup)	11/14/2001	3610 B	<5	NA	<5	137000	137000	10.3	NA	NA	NA	1800	<7	NA	<20	NA
ם ו		2.24	0.0	NA	0.0	1.45	2.21	29.05	NA	NA	NA	11.76	0.0	NA	0,0	NA
LAW05-150	3/16/2002	NA	<5	NA	<5	NA	NA	<10	NA	<100	NA	<1000	<7	NA	<20	NA
LAW05-150 (Dup)	3/16/2002	NA	<5	NA	<5	NA	NA	<10	NA	<100	NA	<1000	<7	NA	59.6	NA
RPD		NA	0.0	NA	0.0	NA	NA	0.0	NA	0.0	NA	0.0	0.0	NA	99.50	NA

Notes:

RPD = Relative Percent Difference.

B = Estimated result; result is less than reporting limit.

J = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.

MBB = This analyte is present at a reportable level in the associated method blank but is less than 5% of the sample amount.

MBD = This analyte is present in the associated method blank at an amount that is less than two times the reporting limit.

MBE = This analyte is present in the associated method blank.

NA indicates chemical was not on the target analyte list for that sample.

This table only includes target analytes detected in one or more Facility Investigation samples.

See Appendix B for the complete target analyte lists.

Page 2 of 2

Table D-9 Summary of Detection in Project Equipment Blanks Morton International, Inc. Reading, Ohio

			Vola	atile Org	anic Co	ompou	nds (V	OCs)		O Cor	nivolat rganic npoun VOCs	ds	Pesti	cides								Inor	ganics							
Sample Date	Sample Type	1,2-Dichloroethane	2-Butanone	Acetone	Chloroform	Chloromethane	Methylene chloride	Tetrachloroethene	Toluene	4-Methylphenol	bis(2-Ethylhexyl) phthalate	Diethyl phthalate	beta-BHC	Endrin	Aluminum	Antimony	Beryllium	Cadmium	Calcium	Calcium-DISS	Copper	Cyanide, Total	Iron	Magnesium	Magnesium-DISS	Manganese	Mercury	Potassium	Thallium	Total Sulfide
3/14/2001	Equipment Blank	<1	<10	<10	<1	<2	<1	<1	<1	<10	A STREET, SQUARE, SQUA	<10		<0.05	NA	<10	<5	<2	NA	NA	<25	<10	NA	NA	NA	NA	<0.2	NA	<10	<1000
4/4/2001	Equipment Blank	<1	<10	<10	<1	<2	<1	<1	<1	<10	5.1 J		< 0.05	< 0.05	33.3 B	Committee Commit	0.65 B		609 B	NA	<25	<10	159	108 B	NA	5 B	<0.2	181 B	<10	<1000
4/17/2001	Equipment Blank	<1	<10	<10	<1	<2	<1	<1	<1	<10	<10		<0.05	< 0.05	38.5 B	<10	<5	<2	345 B	NA	<25	<10	<100	93.6 B	NA	1.3 B	0.11 B	<5000	<10	<1000
5/4/2001	Equipment Blank	<1	<10	<10	<1	<2	<1	<1	<1	<10	<10	<10	<0.05	<0.05	53.1 B	4 B	<5	<2	<5000	NA	<25	4 B	<100	<5000	NA	<15	<0.2	170 B	<10	1100
7/28/2001	Equipment Blank	<1	<10	1.6 J	<1	<2	<1	<1	<1	<10	5 J B	1.4 J	< 0.05	<0.05	43.3 B	<10	<5	<2	<5000	NA	<25	<10	<100	41.7 B	NA	<15	<0.2	182 B J	5.4 B	<1000
8/7/2001	Equipment Blank	<1	0.7 J	3.3 J	<1	0.27 J	<1	<1	<1	<10	<10	<10	< 0.05	< 0.05	<200	<10	<5	<2	<5000	NA	<25	<10	<100	<5000	NA	1.2 B	<0.2	<5000	<10	1200
8/23/2001	Equipment Blank	<1	<10	1.4 J B	<1	<2	<1	<1	<1	<10	<10	1.2 J	< 0.05	<0.05	<200	<10	<5	<2	455 B	NA	<25	<10	224	99.3 B	NA	8.3 B	<0.2	<5000		<1000
10/9/2001	Equipment Blank	<1	<10	1.1 J	<1	<2	<1	<1	<1	<10	<10	<10	< 0.05	< 0.05	<200	<10	<5	<2	<5000	NA	<25	And the Control of the Control	<100		NA	<15	<0.2	<5000	8	2000
10/12/2001	Equipment Blank	0.38 J	0.78 J	1.1 J	<1	<2	<1	0.31 J	<1	<10	<10	1.3 J	< 0.05	< 0.05	36.7 B	<10	<5	<2	254 B	NA	<25	<10	<100	55.3 B	NA	<15	<0.2	180 B J		2300
11/8/2001	Equipment Blank	<1/	1.4 J	0.94 J B	0.28 J	<2	0.41 J	<1	0.22 J	<10	<10	<10	< 0.05	<0.05	63 B J	<10	<5	<2	<5000	NA	<25		<100		NA	<15	<0.2	161 B J	<10	1300 J
11/11/2001	Equipment Blank	<1	1.6 J	3.1 J B	<1	<2	<1	<1	0.22 J		<10	<10	< 0.05	< 0.05	<200	<10	<5	<2		314 B J	<25	<10	<100		75.5 B	<15	<0.2	53 B	<10	<1000
11/14/2001	Equipment Blank	<1	0.82 J	2.4 J	<1	<2	<1	<1	<1	<10	<10	<10	< 0.05	<0.05	<200	2.5 B	<5	0.71 B	<5000	NA	6 B		CONTRACTOR OF THE PARTY OF THE	33.1 B J	The second second second	<15	<0.2	<5000		1100
3/5/2002	Equipment Blank	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200000000000000000000000000000000000000	89.3 B J	CONTRACTOR OF THE PARTY OF THE	<5	<2	<5000	NA	<25	Charles Advanced	SEA CONTRACTOR	84.9 B J		<15		266 B J		NA
3/6/2002	Equipment Blank	<1	NA	1.4 J B	<1	NA	<1	NA	<1	<10	NA		0.0088 J			<10	<5	<2	<5000	NA	27.7			86.9 B J		<15	<0.2	284 B J		NA
3/16/2002	Equipment Blank	<1	NA	1.1 J	<1	<2	0.44 J	<1	<1	<10	<10	<10	< 0.05	< 0.05	NA	<10	<5	<2	NA	NA	<25	<10	NA	NA	NA	NA	0.07 B	NA	<10	<1000

Notes VOCs, SVOCs and Pesticide Results:

J = Estimated result; result is less than reporting limit.

B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NA indicates chemical was not on the target analyte list for that sample.

Notes for Inorganic Results:

J = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B = Estimated result; result is less than reporting limit.

P:\7168\FI Report\QA Appendix\ Equip blank_Crosstab

Table D-10 Summary of Detections in Trip Blanks Morton International, Inc. Reading, Ohio

Units: µg/L

		Chits.	10			
Sample Date	Sample Type	2-Butanone	Acetone	Carbon disulfide	Methylene chloride	Trichloroethene
3/8/2001	Trip Blank	<10	<10	<1	<1	<1
3/9/2001	Trip Blank	<10	<10	<1	0.34 J	<1
3/10/2001	Trip Blank	<10	<10	<1	<1	<1
3/11/2001	Trip Blank	<10	<10	<1	<1	<1
3/13/2001	Trip Blank	<10	<10	<1	<1	<1
3/14/2001	Trip Blank	<10	<10	<1	<1	<1
3/19/2001	Trip Blank	<10	<10	<1	<1	<1
3/21/2001	Trip Blank	<10	<10	<1	<1	<1
3/23/2001	Trip Blank	<10	<10	<1	<1	<1
3/26/2001	Trip Blank	<10	<10	<1	<1	<1
3/27/2001	Trip Blank	<10	<10	<1	<1	<1
4/2/2001	Trip Blank	<10	<10	<1	<1	<1
4/4/2001	Trip Blank	<10	<10	<1	<1	<1
4/5/2001	Trip Blank	<10	<10	<1	<1	<1
4/6/2001	Trip Blank	<10	<10	<1	<1	<1
4/7/2001	Trip Blank	<10	<10	<1	0.58 J B	<1
4/9/2001	Trip Blank	<10	<10	<1	<1	<1
4/11/2001	Trip Blank	<10	<10	<1	<1	<1
4/17/2001	Trip Blank	<10	<10	<1	<1	<1
5/4/2001	Trip Blank	<10	<10	<1	<1	<1
5/5/2001	Trip Blank	<10	<10	<1	1.1	<1
5/7/2001	Trip Blank	<10	<10	<1	0.37 J	<1
5/8/2001	Trip Blank	<10	<10	<1	<1	<1
7/24/2001	Trip Blank	<10	<10	<1	<1	0.15 J B
7/25/2001	Trip Blank	1.6 J	<10	<1	0.37 J B	0.14 J B
7/27/2001	Trip Blank	1.4 J	<10	<1	0.36 J	<1
7/28/2001	Trip Blank	<10	<10	<1	<1	<1
7/29/2001	Trip Blank	0.86 J	<10	<1	<1	<1
8/1/2001	Trip Blank	<10	<10	<1	<1	<1
8/7/2001	Trip Blank	<10	<10	<1	0.42 J	<1
8/22/2001	Trip Blank	<10	<10	<1	<1	<1
8/23/2001	Trip Blank	<10	<10	<1	0.38 J B	<1
9/5/2001	Trip Blank	<10	<10	<1	0.4 J B	<1
10/9/2001	Trip Blank	<10	<10	<1	<1	<1
10/10/2001	Trip Blank	<10	<10	<1	<1	<1
10/11/2001	Trip Blank	NA	0.64 J B	0.33 J	0.35 J B	NA
10/12/2001	Trip Blank	<10	<10	<1	0.56 J	<1
10/13/2001	Trip Blank	<10	<10	<1	<1	<1
11/8/2001	Trip Blank	NA	<10	<1	0.45 J B	<1
11/9/2001	Trip Blank	<10	<10	<1	0.5 J	0.2 J B
11/10/2001	Trip Blank	NA	<10	0.24 J	0.34 J	<1

Table D-10 Summary of Detections in Trip Blanks Morton International, Inc. Reading, Ohio

Units: µg/L

Sample Date	Sample Type	2-Butanone	Acetone	Carbon disulfide	Methylene chloride	Trichloroethene
11/10/2001	Trip Blank	<10	<10	<1	0.37 J	<1
11/11/2001	Trip Blank	<10	<10	<1	0.38 J	<1
11/13/2001	Trip Blank	NA	<10	<1	<1	<1
11/14/2001	Trip Blank	<10	<10	<1	0.37 J B	<1
11/15/2001	Trip Blank	NA	<10	<1	<1	<1
11/15/2001	Trip Blank	<10	<10	<1	<1	<1
11/16/2001	Trip Blank	NA	<10	<1	<1	<1
3/6/2002	Trip Blank	NA	1.4 J B	<1	0.41 J	NA
3/16/2002	Trip Blank	NA	<10	<1	<1	<1

Notes:

J = Estimated result; result is less than reporting limit.

B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NA indicates chemical was not on the target analyte list for that sample.

FACILITY INVESTIGATION (FI)

QA Field Audit Report
Report #1
Rohn and Hass Company

Site Visit: May 7 - 8, 2001

Field Audit Conducted by:

Richard Frappa – FI QA Officer

AUDIT REPORT

A site visit was conducted on May 7-8, 2001 to audit field activities during the FI at the Rohn and Haas Company, Morton International, Inc. facility in Reading, Ohio. The purpose of the audit was to: 1. verify that established procedures described in the Quality Assurance Project Plan (QAPP) dated November 2000 are being followed; and, 2. identify the need for corrective actions, if necessary. The field audit involved: conducting interviews of field staff; identifying field procedures not in conformance with the Work Plan or QAPP; assessing the completeness of daily records; evaluating field equipment calibration records; reviewing sample tracking, chain of custody, and sample security procedures; and assessing the proper frequency of sample field quality control checks.

INTERVIEWS

The following Geomatrix staff were on-site and interviewed during the field audit:

Tim Jennings – Field Team Leader Erik Mansell – Sample Collection Specialist Charles Young – Sample Collection Specialist

Field activities were observed and each staff member was interviewed to identify non-conformance with field procedures specified with the Work Plan and QAPP.

FI Activities Performed During Audit

The first round of groundwater sampling activities were ongoing during the audit. Sampling activities were initiated on May 4 and were completed on May 9, 2001. Conformance with sampling procedures presented in the QAPP and satisfaction of data quality objectives were evaluated while observing sampling activities at the following

groundwater monitoring wells: UAW-20-60, UAW-02-20, UAW-02-40, UAW –04-20, UAW-3-20, and UAW7-20. During the audit, Mr. Todd Quillen of TechLaw, Inc. was providing oversite on behalf of the U.S. EPA.

Completeness of Daily Records

Daily records documenting field activities, borehole logs, well construction logs, equipment calibration records, sample control logs, and chain of custody records were reviewed for completeness. All records, including telephone conversation logs and meeting minutes, are maintained in three-ring binders located in the on-site Geomatrix field trailer. Daily records for the FI were complete.

Corrective Action - None required.

Field Equipment Calibration Records

Prior to and at the time of the audit, the following field equipment was in use: photoionization detector (PID); an electronic water level sounder, and instruments to measure field measured parameters for groundwater samples (i.e., pH meter, specific conductance meter, dissolved oxygen meter, and turbidimeter. Field equipment calibration records were present for each day of equipment usage and reviewed. Calibration results were consistent with instrument calibration parameters identified in the equipment operation manuals and maintenance SOPs.

Corrective Action - None required.

Sample Tracking, Chain of Custody and Sample Security and Labeling

The integrity of sample collection during the FI was assessed through evaluating sample tracking and chain of custody records, as well as, sample security and bottle labeling procedures. Current procedures are adequate to ensure the integrity of samples collected thus far in the FI.

Corrective Actions – None required.

Collection of Field Quality Control Checks

Field quality control (QC) samples include the collection of blind duplicate samples, matrix spike (MS) and matrix spike duplicate (MSD) samples, field equipment blanks for VOC and SVOC analysis, and inclusion of trip blanks with each cooler containing samples to be analyzed for VOCs. Greater than 20 groundwater samples were to be collected during the

sampling round necessitating the collection of two blind duplicate samples, two MS and MSD samples, and two field equipment blank samples. A review of the sample control logs and chain of custody forms indicated that one set of QC samples were collected for analysis of TCL organic parameters. It was recommended that the second set of QC samples be analyzed for Appendix IX parameters since sampling and analyses for these compounds was to occur on May 9, 2001. Therefore, an adequate number of field quality control samples were collected during the first groundwater sampling event.

Corrective Action – None required.

FIELD AUDIT CONCLUSION

Procedures practiced by Geomatrix field staff are in conformance with the QAPP and sufficient to achieve project data quality objectives.

FACILITY INVESTIGATION (FI)

Morton International Inc.
Reading, Ohio
QA Field Audit Report
Report #2

Site Visit: November 9 to 11, 2001

Field Audit Conducted by:

Anne Haikola

AUDIT REPORT

A site visit was conducted from November 9 to 11, 2001 to audit field activities during the FI at the Rohn and Haas Company, Morton International, Inc. facility in Reading, Ohio. The purpose of the audit was to:

- 1) Verify that established procedures, including Field Operating Procedures, described in the Quality Assurance Project Plan (QAPP) dated November 2000 are being followed; and
- 2) Identify the need for corrective actions, if necessary.

The field audit involved: conducting interviews of field staff; identifying field procedures not in conformance with the Work Plan or QAPP; assessing the completeness of daily records; evaluating field equipment calibration records; reviewing sample tracking, chain of custody, and sample security procedures; and assessing the proper frequency of sample field quality control checks.

INTERVIEWS

The following Geomatrix staff were on-site and interviewed during the field audit:

Erik Mansell – Field Team Leader Charles Young – Sample Collection Team Julie So– Sample Collection Team

Field activities were observed and each staff member was interviewed to identify non-conformance with field procedures specified with the Work Plan and QAPP.

During the audit, Mr. Ron Lantzy with Rohm and Haas was present and Mr. Todd Quillen of TechLaw, Inc. was providing oversight on behalf of the U.S. Environmental Protection Agency (USEPA).

FI Activities Performed During Audit

Two primary FI activities were ongoing during the field audit.

- The second complete round of groundwater sampling activities was initiated on November 8, 2001 and completed on November 16, 2001. Conformance with sampling procedures presented in the QAPP and satisfaction of data quality objectives were evaluated while observing sampling activities at the following groundwater monitoring wells: UAW17-40, UAW02-40, UAW02-20, UAW11-10, UAW21-80.
- Trenching at geophysical anomalies located in the vicinity of Anomaly "I" and the Former Swale Area. Conformance with trenching procedures and satisfaction of data quality objectives were evaluated while observing trenching activities at T-5, T-6, and T-7.
- Soil samples were collected in conjunction with trenching and facility investigation requirements. Conformance with sampling procedures presented in the QAPP and satisfaction of data quality objectives were evaluated while observing collection of the following soil samples: DP29-5, T-6-3, T-6-7.5, T-6-10,

Completeness of Daily Records

Daily records documenting field activities, equipment calibration records, sample control logs, and chain of custody records were reviewed for completeness. Daily records for the FI were complete.

Corrective Action - None required.

Field Equipment Calibration Records

The following field equipment was in use during the audit: photoionization detector (PID); Oxygen Meter, H₂S gas meter, an electronic water level sounder, and instruments to measure field parameters for groundwater samples (i.e., pH meter, specific conductance meter, dissolved oxygen meter, and turbidimeter). Field equipment calibration records were present for each

day of equipment usage and reviewed. Calibration results were consistent with instrument calibration parameters identified in the equipment operation manuals and maintenance SOPs.

Corrective Action - None required.

Sample Tracking, Chain of Custody and Sample Security and Labeling

The integrity of sample collection during the FI was assessed through evaluating sample tracking and chain of custody records, as well as, sample security and bottle labeling procedures. The sample team maintained up to date sample tracking records, and samples were secured from collection to receipt by the laboratory. Each bottle was clearly labeled, and packed coolers were secured with custody tape. Based on these observations, current procedures are adequate to ensure the integrity of samples collected in the FI.

However, minor errors were found on the chain of custody forms documenting the number of groundwater sample containers. While the correct number and volume of sample containers were provided to the laboratory, the tally of bottles varied and was, therefore, inaccurate throughout the chain-of-custody documentation.

Corrective Actions – The sample team should implement a structured inventory check between the sample bottles and the contents of each sample cooler prior to signing the chain of custody form and securing the samples for final shipment. For this groundwater sampling program, three groundwater samples can typically be packed within two sample coolers. If the sample team plans ahead, the contents of each cooler can be pre-determined, thereby streamlining the completion of chain of custody records. To facilitate the procedure, the sample team could complete the chain of custody records at the time of sample collection, then do a final inventory check back in the office trailer, as part of the sample packing procedure. To summarize this three-step approach: 1) plan sampling and sample cooler needs for the day 2) complete chain of custody documentation at the time of sample collection and keep bottle sets organized for final packing. 3) At the end of the day, while re-packing each cooler with fresh ice for final shipment, double-check the number of sample bottles against the chain of custody.

Impact on FI Data Objectives – The laboratory received the correct number and volume of sample bottles for the required analyses. Therefore, there is no impact to the quality of the data.

Collection of Field Quality Control Checks

Field quality control (QC) samples include the collection of blind duplicate samples, matrix spike (MS) and matrix spike duplicate (MSD) samples, field equipment blanks, and inclusion of trip blanks with each cooler containing samples to be analyzed for VOCs. Logistical coordination for the laboratory dictates that MS/MSD samples be collected for each media (soil or water) within the first day of sampling and at increments of 1 MS/MSD per 20 samples thereafter, so that laboratory batch QC be performed on project samples.

A review of the sample control logs, chain of custody forms, and STL laboratory log-in documentation indicated the following:

- Blind duplicates and field blanks were being collected at the prescribed frequency.
- While trip blanks are regularly included with each cooler containing samples analyzed for VOCs, there was an oversight on the 11/8/01 shipment. The field sampling team did not include a trip blank with the sample cooler, even though it was indicated on the chain-of-custody records. A report of this discrepancy was generated by STL.
- As of 11/9/01, the sample teams had yet to collect an MS/MSD sample for laboratory batch QC. At the direction of the QA auditor, an MS/MSD for groundwater was collected on 11/10/01.

Corrective Action – Regarding the oversight of the trip blank in the 11/8/01 sample shipment: Field personnel to review recommended procedure in the Sample Tracking, Chain of Custody and Sample Security and Labeling discussion above.

Impact on FI Data Objectives – Regarding the oversight of the trip blank in the 11/8/01 sample shipment: The purpose of the trip blank is to determine if a batch of samples is being exposed during sample handling and shipment to volatile organics that might contaminate the environmental samples. Based on the many batches of samples submtited to the laboratory, and the results from the 11/8/01 samples, it does not appear that evaluation of a trip blank would be required to determine if there is cross contamination biasing the sample batch. Therefore, there is no impact to the quality of the data.

FIELD AUDIT CONCLUSION

While there are opportunities to improve field practices, the procedures observed during the QA audit are in conformance with the QAPP and sufficient to achieve project data quality objectives.

No. 001	(Number logs sequentially throughout the course of the FI field operations)
Date <u>3/3</u>	1 /
Complete	ed by Mark P. Hemingway
-	Log: To document actions which were not specified in the FI Work heir basis, cause, and impact on project objectives.
This Log address	ses a: (Select One)
sel 🖊	ected based on unanticipated field conditions, identification of an proved approach, or other conscious rationale.
wa Ple	enconformance: A deviation from Work Plan procedures which is unintended, but occurred due to oversight or miscommunication. ease indicate any corrective action taken under Rationale or Reason Action or Occurrence, below.
Pla	arification: An action which was generally described in the Work an, but which required a decision to be made about how it would be ecifically implemented.
Pertinent Section	n(s) of FI Work Plan or QAPP: 5.2
Relevant Locati	on(s): STR01
Although the Wo	Action or Occurrence: ork Plan specifies that soil samples for geochemical analysis will be the water table or 15 feet depth, samples were collected for CLP-om depths of ~73 and ~88 feet from STR01.
	ason for Action or Occurrence: ing in sand layers at these depths, which suggested the presence of al impact.
	ata Objectives: Ince will add to the total data set, so it should increase the the data obtained. No negative impacts are anticipated.
Project Manage Project Name: P Project Number:	hase 1 FI Field Activities

No. 002

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.

Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.

Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1, 4.3, 4.3, and 5.2

Relevant Locations: (UAW03, UAW04 and STR02), (UAW05 and UAW06), (UAW07 and UAW08), (UAW12 and UAW13)

Description of Action or Occurrence:

The Work Plan specifies that two soil samples for geochemical analysis will be collected at each well pair or cluster location. For locations along the French drain/slurry wall, typical installations consisted of a well cluster on the downgradient side of the French drain/slurry wall, and a single well on the upgradient side. At these locations, the geochemical soil sampling approach will consist of the collection of three samples:

- One sample from the upper 3 feet of soils;
- One sample from the upper 15 feet or above the water table, upgradient of the French drain/slurry wall; and
- One sample from the upper 15 feet or above the water table, downgradient of the French drain/slurry wall.

No. 002 [cont'd]

Rationale or Reason for Action or Occurrence:

The single soil from the upper 3 feet will be representative of surface soil conditions at that cluster/pair location. The samples on either side of the French drain/slurry wall will aid in evaluating the effectiveness of that system.

Impact on FI Data Objectives:

The logged variance will add to the total data set, so it should increase the completeness of the data obtained. The collection of the pair of subsurface samples will better support the objective of evaluating existing interim measures at the Morton Facility. No negative impacts are anticipated.

Project Manager Signature:

Project Name: Phase 1 FI Field Activities

No. 003

(Number logs sequentially throughout the course of the FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
 Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
 Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: A3.2

Relevant Sample(s): UAW12-20-12', UAW13-20-1.5', UAW13-20-11.5', and UAW08-20-8'

Description of Action or Occurrence:

Although the QAPP specifies that trip blanks will accompany each batch of sample containers to the laboratory, the sample cooler from March 24, 2001 was shipped without trip blanks. This cooler contained soil samples UAW12-20-12', UAW13-20-1.5', UAW13-20-11.5', and UAW08-20-8'

Rationale or Reason for Action or Occurrence:

Error on the part of field personnel. Corrective action: Change in procedure, with placement of trip blanks into cooler prior to drilling and sampling. Regular checking of cooler contents prior to sealing by Field Team Leader.

No. 003 [cont'd]

Impact on FI Data Objectives:

The purpose of trip blanks is to measure possible volatile cross-contamination derived from the ambient conditions encountered during the round-trip of sample containers from the lab, to the project site, and back to the lab. In accordance with the QAPP, one trip blank should go with every shipment. However, given the large number of trip blanks anticipated for the overall FI, it will be possible to correlate the potential cross contamination of this shipment with the results of other project trip blanks. Therefore, the omission of one trip blank should not have a significant impact on assessment of the accuracy of the data. In addition, preliminary results from trip blanks for the FI received to date have been non-detect for all analytes.

Project Manager Signature:

Project Name: Phase 1 FI Field Activities

No. 004

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log a	addresses a: (Select One)
	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance : A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Table A4-2

Relevant Sample(s): UAW12-20-12', UAW13-20-1.5', UAW13-20-11.5', and UAW08-20-8'

Description of Action or Occurrence:

Although the QAPP specifies that a separate sample jar will be used for dioxin/furan analysis of soil samples under the App IX-TAL, a dioxin/furan container was not filled or shipped or requested on the chain-of-custody for samples UAW12-20-12', UAW13-20-1.5', UAW13-20-11.5', and UAW08-20-8.'

Rationale or Reason for Action or Occurrence:

Error on the part of field personnel. Corrective Action: Discussion with the analytical laboratory, which confirmed that they would be able to use soil from other containers to meet dioxin/furan analytical needs. Regular review of containers and chain-of-custody records by the Field Team Leader, to confirm correct sample container use and analytical request.

No. 004 [cont'd]

Impact on FI Data Objectives:

The purpose of providing a separate jar for the dioxin/furan analysis is procedural and not dictated by QA/QC protocols. STL's California laboratory performs the dioxin/furan analysis, while the remaining analyses are performed by the North Canton, Ohio laboratory. Shipment of separate bottle sets facilitates sample distribution to the appropriate analysts. The requisite analysis will still be performed, so no impact on FI data objectives is anticipated.

Project Manager Signature: <u>(</u>

Project Name: Phase 1 FI Field Activities

No. 005

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

-	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance : A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1, Figures 4-1, 4-2, and 4-3

Relevant Location(s): STR07 and STR08

Description of Action or Occurrence:

Although the Work Plan specifies that six stratigraphic borings were to be advanced during Phase 1 of the FI, two additional stratigraphic borings were advanced (STR07 and STR08) in order to close data gaps identified during Phase 1 drilling, and improve planning for well installation.

Rationale or Reason for Action or Occurrence:

Complexity of Morton Facility shallow subsurface (i.e., Upper Aquifer).

Impact on FI Data Objectives:

The logged variance will add to the total data set, so it should increase the completeness of the data obtained. To negative impacts are anticipated.

A¢tivities

Project Manager Signature: (/

Project Name: Phase 1 FI Field

No. 006

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1; Figures 4-1, 4-2, and 4-3, Table 9-1

Relevant Locations: Obsolete monitoring wells

Description of Action or Occurrence:

Although the Work Plan specifies that the plugging and abandonment of existing monitoring wells was to be performed during Phase 1, this activity has been rescheduled for Phase 2.

Rationale or Reason for Action or Occurrence:

Simplification of Phase 1 activities.

Impact on FI Data Objectives:

The plugging and abandonment is not considered time critical and generates no data. No impact on FI data objectives is any pated.

Project Manager Signature:

Project Name: Phase 1 FI Field Activitie

No. 007

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1, 4.2; Figures 4-1, 4-2, 4-3

Relevant Location(s): Reported Waste Burial Areas B, C, and F, and the Former Swale Area (SWMU 10)

Description of Action or Occurrence:

Although the Work Plan specifies that no surface geophysical survey was to be performed at suspected waste burial area F, because of the presence of a tank berm, a survey was performed in the area adjacent to the berm. Geophysical survey coverage at Areas B, C, and F, and at the former Swale Area (SWMU 10) was also increased above that specified in the Work Plan.

Rationale or Reason for Action or Occurrence:

Field reconnaissance confirmed that Area F was more accessible to geophysical survey than previously believed. The geophysical survey in Areas B, C, and F, and at the Former Swale Area were expanded where possible to increase the data generated on possible waste burial.

Impact	οn	FΙ	Data	Ohie	ctives
Impact	() []	rı	11212	CODIC	CLIVES:

The logged variance will add to the total data set, so it should increase the completeness of the data obtained. Moregative impacts are anticipated.

Project Manager Signature:

Project Name: Phase 1 FI Field

No. 008

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

This I as addresses as (Select One)

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Tills Log	addresses a. (Select Olic)
	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1, 4.3, 4.3, and 5.2

Relevant Sample(s): UAW12-20-2.5', UAW08-20-2', and UAW04-20-2'

Description of Action or Occurrence:

As stated in the Work Plan and further clarified in Log No. 002, in the case of well pairs or well clusters location, one sample will be collected at that location from the upper 3 feet of soils. However, on three occasions the field team inadvertently collected two samples from the 0 to 3 feet depth interval, and included the extra samples in shipments to the laboratory.

Rationale or Reason for Action or Occurrence:

Error on the part of field personnel. Corrective action: Directed the laboratory not to analyze the extra samples. Review of the Work Plan scope of work prior to sample collection and again prior to sample shipment to verify that all objectives and criteria have been met.

No. 008 [cont'd]

Impact on FI Data Objectives:

The laboratory was able to comply with request to not analyze the extra samples. No impact on FI data objectives is appricipated.

Project Manager Signature: 2

Project Name: Phase 1 FI Field Activities

No. 009

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.

Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.

Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: A5.1

Relevant Sample(s): STR01-3', STR01-15', STR01-21', and STR01-29.

Description of Action or Occurrence:

A copy of the chain-of-custody was not shipped with the sample cooler.

Rationale or Reason for Action or Occurrence:

Error on the part of field personnel. Corrective Action: Faxed a copy of the chain-of-custody record to the analytical laboratory, followed by a mailed hard copy. Regular inventory of all contents before sealing the sample coolers for shipment by the Field Team Leader.

Impact on FI Data Objectives:

No impact on FI data objectives is applicated.

Project Manager Signature:

Project Name: Phase 1 FI Field Activities

No. 010

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
 Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
 Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 4.1, 4.2; Figures 4-1, 4-2, 4-3

Relevant Sample(s): UAW04-20-10', UAW05-20-1.5', and UAW05-20-13'

Description of Action or Occurrence:

Given the schedule of work, which routinely includes weekends, samples collected on Fridays were intended to be delivered via overnight carrier to the laboratory on Saturday. This would allow extraction for VOCs of the soil samples collected on Friday within or close to the 48-hour timeframe specified by USEPA Region 5 guidance. Samples shipped on Friday, March 23, 2001, however, were not marked for Saturday delivery, and were not received by the laboratory until Monday, March 26, 2001.

Rationale or Reason for Action or Occurrence:

Error on the part of field personnel. Corrective Action: Discussion with the analytical laboratory, in order to expedite extraction to minimize the exceedence of the recommended 48 hours. Regular review of shipping waybills by the Field Team Leader, to confirm correct designation of shipping time.

No. 010[cont'd]

Impact on FI Data Objectives:

The logged non-conformance increased the hold time on the designated samples, and so may affect the accuracy of VOC analysis for those samples. It should be noted, however, that the samples were in zero headspace containers in a chilled cooler during this hold time (samples were still at 4.1 °C at the time of their receipt by the laboratory). In addition, they were collected from borings being used for monitoring well installation. This means that groundwater samples will be collected from the affected locations, and may be used to verify the soil sampling results. Preliminary results for VOCs from the affected samples are consistent with other samples from the same area of the Morton Facility. On balance, the reduction in sample accuracy is anticipated to be minimal, and is not anticipated to significantly affect the overall FI objectives.

Project Manager Signature:

Project Name: Phase 1 FI Field Activitie

No. 011 (Number logs sequentially throughout the course of the

FI field operations)

Date 3/31/01

Completed by Mark P. Hemingway

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
Nonconformance : A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: A5.1

Relevant Sample(s): volatile organic analyses of soil samples

Description of Action or Occurrence:

Encore samples will be preserved by the laboratory by freezing in water.

Rationale or Reason for Action or Occurrence:

Based on testing of the first shipments of Encore soil samples for volatile organic analyses, it was determined that the soil samples from the subject property reacted strongly with the sodium bisulfate preservative. This occurred due to the natural abundance of calcareous materials in the soil from the subject property and surrounding areas. The analytical method allows for preservation by freezing when soil samples effervesce. Additionally the analyte list contains many compounds that the laboratory found either perform poorly and erratically in the sodium bisulfate matrix or do not respond sufficiently for analysis. It was determined that the consistent approach of freezing all the project samples in water would be the best approach.

No. 011 [cont'd]

Impact on FI Data Objectives:

No impact on FI data objectives is anticipated. The preservation method is

consistent with analytical methodologic.

Project Manager Signature:

Project Name: Phase 1 FI Field Activities

No. 012

(Number logs sequentially throughout the course of the

FI field operations)

Date <u>7/29/01</u>

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
1	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 5.6

Relevant Sample(s): 072901142 – Sample from the Recovery Well

Description of Action or Occurrence:

A groundwater sample (072901142) collected on July 29, 2001 was mistakenly sent to the lab for the CLP-TAL analysis suite. This sample should have been sent in for the Appendix IX analysis suite. The laboratory was contacted on July 31, 2001 to change the analyses requested from CLP-TAL analysis, to the Appendix IX analysis. The laboratory changed the analysis requested and had enough sample volume to proceed with the Appendix IX analysis.

Rationale or Reason for Action or Occurrence:

Oversight by the sampling personnel. Corrective Action: Personnel to review the FI Work Plan for analytical requirements.

Impact on FI Data Objectives:

No impact on FI data objectives is antiapated.

Project Manager Signature:

Project Name: Phase 2 FI Field Activities

Project Number: 7443

P:\7168\FI Report\QA Appendix\Variance-Nonconform Logs.doc

Page 18 of 29

No. 013

(Number logs sequentially throughout the course of the

FI field operations)

Date <u>7/11/01</u>

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log addresses a: (Select One)

-	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: 5:13

Relevant Sample(s): Not Applicable

Description of Action or Occurrence:

Based on field conditions encountered during initial work, Geomatrix recommended modifications to the investigation approach of the CSS evaluation. Geomatrix outlined the scope and rationale for the revised CSS evaluation in a letter to the USEPA dated July 11, 2001.

Rationale or Reason for Action or Occurrence:

Camera survey of the sewer was slow and difficult, and it was determined that camera evaluation of the all sewer lines was not an efficient investigation method.

Impact on FI Data Objectives:

No impact on FI data objectives is anticipated. The revised CSS evaluation approach will meet the objectives put forward in the FI Work Plan and the requirements of the Administrative Order.

Project Manager Signature:

Project Name: Phase 2 FI Field Aprivities

Project Number: 7443

Page 19 of 29

No. 014

(Number logs sequentially throughout the course of the

FI field operations)

Date 10/10/01

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log a	adresses a: (Select One)
	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
10	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: A.10.1.1

Relevant Sample(s): Not applicable

Description of Action or Occurrence:

Section A.10.1.1 states that the Geomatrix QA Officer will conduct an internal audit of field activities at least once every three months.

Rationale or Reason for Action or Occurrence:

Oversight by the management personnel. Corrective Action: Personnel to review the FI Work Plan and Quality Assurance Project Plan. Audit to be scheduled.

Impact on FI Data Objectives:

No impact on FI data objectives is anticipated. While an internal field audit was not performed this quarter, internal Geomatrix staff have reviewed the field documentation from the months of July to September 2001. The daily field records, sampling records, field measurements and other field documentation have been completed in accordance with Quality Assurance protocols.

An internal field audit is scheduled for the November 2001 groundwater sampling.

Project Name: Phase 2 FI Field Activities

No. 015

(Number logs sequentially throughout the course of the

FI field operations)

Date 10/10/01

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
 Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
 Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Sections 5.1 and 5.2

Relevant Sample(s): DP04, DP06, DP11, DP21, DP22, DP24, DP26, DP27, and DP28

Description of Action or Occurrence:

Ten borings were completed in the northeastern portion of the plant (DP04, DP06, DP11, DP21, DP22, DP23, DP24, DP26, DP27, and DP28). Two soil samples were collected for geochemical analysis from DP23. The activities were beyond the original scope of work.

Rationale or Reason for Action or Occurrence:

These borings were completed to gain a better understanding of the shallow (<25-foot depth) lithology, particularly the shallow sand in the northeastern portion of the plant. Prior to boring at these locations, the amount of shallow lithologic data in this area was limited.

Soil samples from DP23 were submitted for chemical analysis because of field indications of chemical impact.

No. 015 [cont'd]

Impact on FI Data Objectives:

The logged variance will add to the understanding of the lithology and to the total data set, so it should increase the completeness of the data obtained. No negative impacts are anticipated.

impacts are anticipated.

Project Manager Signature:

Project Name: Phase 2 FI Field Witties

No. 016

(Number logs sequentially throughout the course of the

FI field operations)

Date <u>1/11/02</u>

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log	addresses a: (Select One)
✓	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Field Operating Procedure – Monitoring Well Development and Groundwater Sampling

Relevant Sample(s): UAW10-50, UAW10-80 and UAW24-70

Description of Action or Occurrence:

Recovery of development water from newly installed wells was less in volume than required by the Work Plan (at least two well volumes plus any volume of water lost during drilling). Wells involved include: UAW10-50, UAW10-80 and UAW24-70.

Rationale or Reason for Action or Occurrence:

The procedure used to install the subject wells involved advancing six-inch outer casing from the surface to the target depth. Core samples were not removed because the stratigraphy had already been established by stratigraphic tests at these locations. Thick clay sequences are present at all of these locations – the result is that the high water pressure and stress placed on the formation by this drilling technique fractured the clay and the vast majority of water used in the drilling was lost in the clays – not the sands in which the wells are screened. Some water returns to the surface occurred during drilling.

Although some formation damage did likely occur due to introduction of fines from overlying clays, the poor transmissivity of the sands at these locations is contributing to low flow from these wells. This low flow character prevented

No. 016 [cont'd]

removal of the prescribed volume of water during development; however, the volume of water lost in the screened sand was less than one half the volume removed during development.

Impact on FI Data Objectives:

Samples from these wells are apparently representative of aquifer waters, based on the behavior of field parameters during development and purging. Given this, there should be no impact on FI data objectives.

Project Manager Signature: (//

Project Name: Phase 2 FI Field Activities

No. 017

(Number logs sequentially throughout the course of the

FI field operations)

Date 1/11/02

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log a	ddresses a: (Select One)
✓	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Field Operating Procedure – Monitoring Well Development and Groundwater Sampling

Relevant Sample(s): LAW-12-60

Description of Action or Occurrence:

Development of monitoring well LAW-12 -60- pH levels in development water were elevated, possibly indicative of grout contamination.

Rationale or Reason for Action or Occurrence:

After extensive development pH levels decreased to 7.5, and the well was sampled for Phase 2 while pH levels were in the ambient range. When the well was sampled in Phase 3, pH levels were again elevated, and the well had to be purged extensively in order to lower the pH to the ambient range.

The likely cause of the elevated pH is communication between the screened interval and the grout annular seal of the well. The mode of this communication is not known, but may include infiltration of grout fluids through the lower portion of the overlying clay stratum. The effect may attenuate naturally with time; in the interim, however, it will be necessary to utilize a modified purging method to obtain representative samples.

No. 017 (cont'd)

The following procedure should be used as long as elevated pH persists: Start by attempting to follow standard micro-purge procedures. If the pH is elevated, increase flow rate and macro-purge until pH is lowered to the ambient range. When ambient values for pH are obtained, stop the pump, allow the well to recover to static level, then proceed with standard micro-purge procedures.

Impact on FI Data Objectives:

The Phase 2 and 3 samples from this well are apparently representative of aquifer waters, based on the behavior of field parameters during development and purging. Given this, there should be no impact on FI data objectives.

Project Manager Signature: (

Project Name: Phase 2 FI Field Apprinties

No. 018

(Number logs sequentially throughout the course of the

FI field operations)

Date 3/20/02

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

This Log a	addresses a: (Select One)
	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
	Nonconformance : A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Field Operating Procedures – Calibration and Maintenance of Field Meters, Monitoring Well Development, and Groundwater Sample Collection

Relevant Sample(s): see attached table

Description of Action or Occurrence:

USEPA requested that Geomatrix review the pH values from the well sampling and development records. Based on this review, it was determined that the pH readings may reflect the use of a temperamental pH meter.

Rationale or Reason for Action or Occurrence:

The attached table summarizes the <u>final</u> pH values for each well, at the conclusion of the pre-sampling purging or the initial well development. These final pH values reflect the stable reading obtained in accordance with our Field Operating Procedures. Given this, they should be data that is most representative of aquifer conditions. Most of the pH values are in the range of 5.5 to 7. This is consistent with normal pH values for natural surface waters or shallow groundwaters, which tend to be slightly acidic. This acidity generally reflects natural acids from organic matter or the dissolution of carbon dioxide.

Note that every well in the table exhibits at least one reading in this normal range. This strongly suggests that the relatively small number of readings below this range probably reflect a fluctuating response from the pH meter, and not actual groundwater pH. Such meters, unfortunately, do tend to be somewhat temperamental under field conditions. We do not believe these lower pH values reflect actual acidic conditions in the subsurface.

To address this issue with field measurements, we will make the following modifications to the field operating procedures and the request for sample analysis:

- In the event that the pH readings for a given well are not within the range of 5.5 to 7.5, the pH meter will be recalibrated and the well will continue to be micro-purged.
- pH calibration solutions will be replaced at the beginning of each sampling event.
- Laboratory measurement of pH in groundwater samples will be added to the request for analysis submitted to Severn Trent Laboratories (STL).

Impact on FI Data Objectives:

The primary purpose of collecting pH measurements is to determine that the groundwater pH, in addition to the parameters of specific conductance, temperature, and turbidity, is stable, ensuring that fresh formation water is sampled. While the exact pH readings may not accurately represent groundwater pH, the measurements are adequate to evaluate change in pH. Additionally, the other field measurements are also used to determine groundwater stabilization prior to sampling. Given this, there should be no impact on FI data apjectives.

Project Manager Signature: <u>U</u>

Project Name: Phase 2 FI Field Activities

pH Summary Morton International, Inc. Reading, Ohio

		pН	
	Sample Event 1	Sample Event 2	Sample Event 3
Well ID	(May 2001)	(October 2001)	(November 2001)
MW-EPA-1	6.55	NA	6.96
MW-EPA-3	6.67	NA	6.26
MW-EPA-4	6.44	NA	6.29
UAW01-30	4.94	NA	7.18
UAW01-80	6.25	6.45	5.70
UAW02-20	6.27	NA	6.95
UAW02-40	6.65	NA	7.36
UAW03-20	6.02	NA	7.54
UAW04-20	5.58	NA	7.36
UAW05-20	7.5	6.87	NA
UAW06-20	6.96	6.81	NA
UAW07-20	6.79	NA	6.92
UAW08-20	7.09	NA	NA
UAW09-20	6.60	NA	5.01
UAW09-60	6.58	NA	5.43
UAW10-50	NA	7.18	NA
UAW10-80	NA	7.48	NA
UAW11-10	7.23	NA	7.36
UAW11-40	6.24	NA	5.17
UAW12-20	5.71	NA	6.61
LAW12-60	NA	7.40	7.51
UAW13-20	4.33	NA	6.51
UAW14-10	6.87	NA	5.05
UAW15-20	6.82	NA	7.32
UAW15-50	7.07	NA	7.96
UAW16-10	NA	6.98	6.40
UAW17-40	6.97	NA	5.41
UAW18-20	NA	7.39	7.05
UAW19-80	6.76	NA	5.21
UAW20-60	6.42	NA	6.43
UAW21-80	4.67	NA	7.45
UAW22-20	NA	6.81	NA
UAW23-20	NA	6.89	6.53
UAW24-70	NA	7.03	7.66
UAW25-20	NA	6.71	6.48

NA Data not available, well not sampled this event.

No. 019

(Number logs sequentially throughout the course of the

FI field operations)

Date $\frac{5/3}{02}$

Completed by Anne M. Haikola

Purpose of this Log: To document actions which were not specified in the FI Work Plan, including their basis, cause, and impact on project objectives.

Inis Log ac	idresses a: (Select One)
	Variance: A deliberate action which varies from the Work Plan, selected based on unanticipated field conditions, identification of an improved approach, or other conscious rationale.
✓	Nonconformance: A deviation from Work Plan procedures which was unintended, but occurred due to oversight or miscommunication. Please indicate any corrective action taken under Rationale or Reason for Action or Occurrence, below.
	Clarification: An action which was generally described in the Work Plan, but which required a decision to be made about how it would be specifically implemented.

Pertinent Section(s) of FI Work Plan or QAPP: Field Operating Procedures – Groundwater Level Measurement

Relevant Sample(s): UAW09-60, water level reading on 11/16/2001

Description of Action or Occurrence:

The water level reading recorded on 11/16/01 at UAW09-60 is anomalous.

Rationale or Reason for Action or Occurrence:

Based on prior water level measurements at UAW09-60 and also the water level measurements collected from the pressure transducer (TrollTM) installed for a month at this well, the depth to water measurement collected on 11/16/01 is an error. It is believed that the field team mis-read the water level by an increment of ten and that the depth to water reading should have been 31.92 feet bgs (not 21.92 feet bgs, as recorded on field documentation).

Impact on FI Data Objectives:

There is no impact to FI data objective

Project Manager Signature:

Project Name: Phase 2 FI Field A/ch/tities



STL North Canton 4101 Shuffel Drive NW North Canton, OH 44720-6961

Tel: 330 497 9396 Fax: 330 497 0772 www.stl-inc.com

Ms. Anne Haikola Geomatrix Consultants, Inc. 5725 Highway 290 W Suite 200-B Austin, TX 78735

Dear Ms. Haikola,

This letter is in response to the Quality Assurance review performed by Environmental Standards for Geomatrix Consultants. The lab SDGs referenced were A1C130135 and A1E090157. The following discussions are in answer to the rejected data found in the reports.

The analyses for acrolein, acetonitrile, propionitrile, and isobutanol in samples 050801115, 050801116, 050801119, TB (COC035534), and TB (COC035535) should be considered unreliable, and the "not-detected" results for these compounds in the aforementioned samples have been flagged "R" on the data summary tables. Very low RRFs (<0.05) were reported for these compounds in the associated initial and/or continuing calibrations.

The analyses for acrolein, acetonitrile, propionitrile, and isobutanol in samples 031401030, 031401031, 031401032, and TB (COC032206) should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low relative response factors (RRFs < 0.050) were observed for these compounds in the associated initial and/or continuing calibration standards. It should be noted that the RRFs are a function of not only the instrument response for the compound, but also of the instrument response for the associated internal standard. If the laboratory had used an internal standard that more closely matched the instrument response for the target compound, the RRFs would have been acceptable and data would not be affected.

The analysis for 4-nitroquinoline-1-oxide in sample 031401030 should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. A very low (<0.05) average relative response factor was observed for this compound in the associated initial multipoint calibration. It should be noted that the RRFs are a function of not only the instrument response for the compound, but also of the instrument response for the associated internal standard. If the laboratory had used an internal standard that more closely matched the instrument response for the target compound, the RRFs would have been acceptable and data would not be affected.

These four volatile compounds are soluble in water and have poor purge efficiency. The lab employs industry standard IS's for the Mass-Spec method. Using an internal standard that is also a poor purger or poor responder does not increase the efficiency of the purge, it just inflates the RRF. Data was not rejected based on the analysis, rather on the choice of internal standard. The minimum RRF is a CLP requirement and these are not CLP analytes, so they may not meet criteria.

The analysis for 4-chloroaniline in sample 031301029, for hexachlorocyclopentadiene in the reanalysis of sample 031301029, and for hexachlorocyclopentadiene in sample 031401030 should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low percent recoveries (<10%) were observed for these compounds in the associated LCS analyses.



STL North Canton

The analyses for 4-chloroaniline in samples 050801113, 05080114, 050801117, 050801118, and 050801120 and for hexachlorocyclopentadiene in samples 050801115, 050801116, and 050801119 should be considered unreliable and the "not-detected" results for these compounds in the aforementioned samples have been flagged "R" on the data summary tables. Very low recoveries (%R<10%) for these compounds were observed in the associated LCS analyses.

At the time of analysis, we were having trouble with 4-chloroaniline recovering in the aqueous LCS. Hexachlorocyclopentadiene never recovers well in a full-analyte spike aqueous matrix. When the Army requested full-analyte spikes, (our first client to request this), an exception was given for hexachlorocyclopentadiene as most labs that they talked to had the same problem. Obviously, this is a problem beyond lab control. For our MDL studies, we extract hexachlorocyclopentadiene by itself to avoid the problem.

The analysis for all acid compounds in samples 031301029 and 031301029-RE should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low recoveries (<10%) were reported for the acid surrogate compound phenol- d_5 in the initial analysis and the re-extraction/reanalysis of the sample for semi-volatile organic compounds.

The lab analyzed the sample, noticed the low recovery, and then re-extracted the sample. The re-extraction confirmed the original analysis. While I realize this did not get the phenol-d₅ above 10%, it is the lab's viewpoint that a matrix effect was limiting the phenol recovery.

The analyses for carbonate alkalinity in all samples, except sample 050801116, should be considered unusable, and the "not-detected" results have been flagged "R" on the data summary tables. Furthermore, the reported positive results for bicarbonate alkalinity and total alkalinity in all samples, except sample 050801116, should be considered estimated and have been flagged "J" on the data summary tables. Very low recoveries (<30%) were observed for total alkalinity in the associated MS/MSD analyses.

The analyses for total phosphorus in samples 050801117 and 050801118 should be considered unusable and the "not-detected" results have been flagged "R" on the data summary tables. Furthermore, the reported positive results for total phosphorus in samples 050801114, 050801120, 050801113, 050801119, and 050801115 should be considered estimated and have been flagged "J" on the data summary tables. Very low recoveries (<30%) were observed for total phosphorus in the MS/MSD analyses.

The rejection of alkalinity and phosphorus was based on low MS/MSD recoveries. The lab policy is if the lab QC (LCS, LCSD, Blank and CCV) is in control, then the MS/MSD is indicative of the matrix and is beyond lab control.

Some of the correctable deficiencies that need to be addressed in the reports are:

In general, for the organic sections, the Initial Calibration can be a mixture of different ICALs for different analytes. An example is the pesticide fraction where the normal pesticides are analyzed and another curve is analyzed for Kepone, and Isodrin. The dates may not correlate with the date of the ICAL, as both ICALs may not be analyzed on the same date.

All detections added by the validators were below our MDLs and are not reportable.



STL North Canton

Our policy is to report the lower of the numbers for the 8000 methods. If in the future you would like the higher number reported, it can be done.

For the 8000 series, the grand mean approach is utilized to ensure that the CCV passes criteria.

I hope this answers some of your questions concerning the data validation reports. If I can be of further assistance, do not hesitate to give me a call at (330) 966-8284.

Sincerely,

Beth Lambert

Quality Assurance Manager



May 10, 2002

Mr. Mark P. Hemingway Principal Hydrogeologist Geomatrix Consultants, Inc. 5725 Highway 290 West Suite 200-B Austin, TX 78735

Dear Mr. Hemingway:

Enclosed is the quality assurance review for the soil and aqueous samples collected on November 8, 9, and 10, 2001, as part of the Morton – Reading, Ohio, Project. Organic sample data were qualified as unreliable due to calibration issues and surrogate compound recoveries. In addition, organic sample data were qualified due to blank contamination, calibration issues, low laboratory control sample recoveries, low surrogate compound recoveries, and reported results below the quantitation limit. Inorganic sample results were qualified as unreliable due to very low matrix spike/matrix spike duplicate recoveries. In addition, inorganic sample data were qualified due to blank contamination, contract-required detection limit standard recoveries, matrix spike/matrix spike duplicate recoveries and precision, and ICP interferences.

With respect to data package deliverables, the laboratory provided sufficient quality control summary forms and supporting raw data to allow for complete validation of the data. Only minor correctable deficiencies were noted during the review of the data.

If you have any questions or comments, or if we can be of further assistance, please feel free to call.

Sincerely

Donald J. Lancaster, M.S.

Senior Quality Assurance Chemist II/

Project Manager

Ruth of Forman For:

Rock J. Vitale, CEAC, CPC

Technical Director of Chemistry/

Principal

Sincerely,

DJL/RJV:hm Enc.



QUALITY ASSURANCE REVIEW OF SAMPLES COLLECTED ON NOVEMBER 8, 9, AND 10, 2001 AS PART OF THE MORTON – READING, OHIO PROJECT

May 10, 2002

Prepared for:

GEOMATRIX CONSULTANTS, INC.

5725 Highway 290 West Suite 200-B Austin, TX 78735

Prepared by:

ENVIRONMENTAL STANDARDS, INC.

1140 Valley Forge Road P.O. Box 810 Valley Forge, PA 19482-0810

TABLE OF CONTENTS

Introduction

Section 1	Quality Assurance Review			
	A.	Organic Data		
	B.	Inorganic Data and General Chemistry Data		
	C.	Conclusions Conclusions		
Section 2	Analy	rtical Results		
Section 3	Orga	nic Data Support Documentation		
Section 4	Inorg	anic and General Chemistry Data Support Documentation		

Section 5 Project Chain-of-Custody Records and Case Narratives

Introduction

This quality assurance (QA) review is based upon a rigorous examination of the data generated from the analyses of the samples collected on November 8, 9, and 10, 2001, as part of the Morton – Reading, Ohio, Project. The samples included in this QA review are presented on Table 1. The laboratory was requested to prepare a detailed data package to substantiate the reported analytical results. The data package that was prepared allowed for the performance of a comprehensive review.

This review has been performed with guidance from the "National Functional Guidelines for Organic Data Review" (US EPA, October 1999) and the "National Functional Guidelines for Inorganic Data Review" (US EPA, February 1994).

The reported analytical results are presented as a summary of the data in Section 2. Data were examined to determine the usability of the analytical results and compliance relative to the analytical requirements specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition" (SW-846) and the Quality Assurance Project Plan Facility Investigation RCRA §3013 Administrative Order for the Morton International, Inc. Facility located in Reading, Ohio. Qualifier codes have been placed next to the results to enable the data user to quickly assess the qualitative and/or quantitative reliability of any result. Details of this QA review are presented in Section 1 of this report. This critical QA review identifies data quality issues for specific samples and specific evaluation criteria. The data qualifications allow the data user to best understand the usability of the analysis results. Data not qualified in this report should be considered valid based on the quality control (QC) criteria that have been reviewed.

TABLE 1
SAMPLES THAT HAVE UNDERGONE
A RIGOROUS QUALITY ASSURANCE REVIEW

Geomatrix Consultants Sample Number	Laborato ry Sample Number	SDG	Matrix	Date Sample Collected	Parameter(s) Analyzed
110801236	A1K090129-001	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110801236MS (Matrix Spike)	A1K090129-001	1K09129	Soil	11/08/01	M, AS
110801236MSD (Matrix Spike Duplicate)	A1K090129-001	1K09129	Soil	11/08/01	M, AS
110801237	A1K090129-002	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110801237RE (Reanalysis)	A1K090129-002	1K09129	Soil	11/08/01	SVOA
110801238	A1K090129-003	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
TRIP BLANK (COC#076403)	A1K090129-004	1K0912 9	Aq	11/08/01	
110801239	A1K090129-005	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110801240	A1K090129-006	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110801241	A1K090129-007	1K09129	Soil	11/08/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110901242	A1K100125-001	1K09129	Soil	11/09/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110901243	A1K100125-002	1K0912 9	Soil	11/09/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110901244	A1K100125-003	1K09129	Soil	11/09/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
110901245	A1K100125-004	1K09129	Soil	11/09/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
111001247	A1K120177-001	1K09129	Soil	11/10/01	V, SVOA, Pest, PCB, D/F, M, CN, AS

TABLE 1 (Cont.)

Geomatrix Consultants Sample Number	Laboratory Sample Number	SD G	Matrix	Date Sample Collected	Parameter(s) Analyzed
111001247MS (Matrix Spike)	A1K120177-001	1K09129	Soil	11/10/01	AS, CN
111001247MSD (Matrix Spike Duplicate)	A1K120177-001	1K0912 9	Soil	11/10/01	AS, CN
111001248	A1K120177-002	1K09129	Soil	11/10/01	V, SVOA, Pest, PCB, D/F, M, CN, AS
TRIP BLANK (COC#076412)	A1K120177-003	1K0912 9	Aq	11/10/01	. V

NOTES:

V - SVOA -	Appendix IX Volatile Organic Compounds by SW-846 Method 8260B. Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C.
Pest -	Appendix IX Organochlorine Pesticides by SW-846 Method 8081A.
PCB -	PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242,
	Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082.
D/ F -	2,3,7,8-Tetrachlorodibenzo-p-dioxin and Select Total Dioxins and Furans by
	SW-846 Method 8280A.
M -	Select Metals (specifically, silver, cadmium, chromium, antimony, arsenic, barium,
	lead, beryllium, selenium, thallium, cobalt, copper, nickel, tin, vanadium, zinc, and
	mercury) by SW-846 Methods 6010B and 7471A.
CN -	Cyanide by SW-846 Method 9012A.
AS -	Acid-soluble Sulfide by SW-846 Method 9030A.
Aq -	Aqueous.

Section 1 Quality Assurance Review

A. Organic Data

The organic analyses of 13 soil samples and two aqueous trip blanks were performed by Severn Trent Laboratories, Inc. (STL) of North Canton, Ohio. Fourteen samples were analyzed for Appendix IX volatile organic compounds by SW-846 Method 8260B; 13 samples (including QC samples and reanalyses) were analyzed for Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C; 12 samples were analyzed for Appendix IX Organochlorine Pesticides by SW-846 Method 8081A; and 12 samples (including QC samples) were analyzed by SW-846 Method 8280A for PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082. In addition, 12 soil samples were analyzed by SW-846 Method 8280A for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, total tetrachlorodibenzo-*p*-dioxins (TCDD), total pentachlorodibenzo-*p*-dioxins (PeCDD), total pentachlorodibenzo-*p*-furans (TCDF), total pentachlorodibenzo-*p*-furans (PeCDF), and total hexachlorodibenzo-*p*-furans (HxCDF) by the STL facility in West Sacramento, California. All analyses are indicated on Table 1 and the analytical results are summarized in Section 2 of this report.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, system monitoring compound recoveries, blank spike (laboratory control sample) recoveries and precision, initial and continuing calibrations, target compound matching quality, analytical sequence, retention times (RTs), gas chromatography/mass spectroscopy (GC/MS) tuning and mass calibration, internal standard performance, quantitation of positive results, and overall system performance.

A few deficiencies were identified as detailed below. The Environmental Standards, Inc. (Environmental Standards) data reviewer has edited the laboratory-reported data and QC summary forms based on the deficiencies and comments listed in this QA review. Furthermore, the Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Organic Data Support Documentation (Section 3) of this review. The following deficiencies and comments do not necessarily affect data usability. Usability is addressed in the subsequent Organic Data Qualifiers section.

Correctable Deficiencies

- 1. In the volatile fraction, the laboratory reported incorrect initial calibration dates, times, and/or file IDs on several of the calibration summary forms.
- 2. In the volatile, semivolatile, and pesticide fractions, the laboratory did not record the relative percent differences (RPDs) between the recoveries for the compounds in the LCS/LCSD analyses. The data reviewer evaluated the RPDs for the target compounds and determined that the RPDs were less than 35%; therefore, data qualification was not warranted.

- 3. In the PCB fraction, the laboratory did not calculate the RPDs between the results for the LCS/LCSD analyses associated with samples 111001247 and 111001248. The data reviewer edited the SW846 8082 Check Sample Duplicate Recovery summary form (Form 3) to include the RPDs, which are within the acceptance limits.
- 4. In the dioxin/furan analysis, the laboratory technician made many hand-written changes to the Dioxin/Furan Review Sheets for the project samples but did not indicate the date the changes were made or his/her initials.
- 5. In the dioxin/furan analysis of sample 111001248, the laboratory reported a detection limit of "0.32 ng/g" for total hexachloro-substituted furans. According to the chromatogram and Signal to Noise Report for the sample, however, it appears that hexachloro-substituted furans are present in the sample, along with a diphenyl ether interference. The laboratory should have reported an estimated maximum probable concentration (EMPC) instead of a detection limit. The data reviewer flagged the detection limit "EMPC" on the data tables.
- 6. In the semivolatile fraction, high percent relative standard deviations (%RSDs>15%) were observed for famphur in the initial calibrations performed on 11/6-11/7/01 and 11/15-11/16/01 on instrument A4HP8. The laboratory used the average relative response factors (RRFs); a calibration curve should have been used in both initial calibrations for this compound (SW-846 Method 8000, Section 7.5). No positive results for these compounds were observed in the project samples; therefore, qualification of data was not warranted. No positive result for this compound was observed in the project samples; therefore, qualification of data was not warranted.
- 7. In the pesticide fraction, high %RSDs (>20%) were observed for *delta*-BHC and 4,4′-DDD in the initial calibration performed on 11/13-11/14/01 on instrument A2HP3 and for chlorobenzilate in the initial calibration performed on 11/20/01 on instrument A2HP5. The laboratory used the average RRFs; calibration curves (or another alternative method of quantitation) should have been used in both initial calibrations for these compounds (SW-846 Method 8000, Section 7.5). No positive results for these compounds were observed in the project samples; therefore, qualification of data was not warranted.

Noncorrectable Deficiencies

- 1. In the volatile fraction, the laboratory did not spike the LCS with all the analytes of interest. According to Method 8260B (Section 8.4.3) and Method 8000B (Section 8.4.1), the LCS should be spiked with all target analytes.
- 2. In the volatile fraction, the laboratory analyzed all matrix spike blank samples before the method blank analysis. According to SW-846 Method 8260B (Section 8.4.1), before processing any samples, the analyst should demonstrate, through the analysis of a method blank, that interferences from the analytical system, glassware, and reagents are under control.

- 3. According to the Nonconformance Memo submitted with the data package, the custody seal on the cooler in which the samples were shipped was broken. The memo, however, states that a strap around the cooler was intact; therefore the integrity of the samples was probably not compromised.
- 4. In the semivolatile fraction, a low recovery of the surrogate compound 2,4,6-tribromophenol was observed in sample 110801238. The laboratory did not reextract and reanalyze the sample. According to SW-846 Method 8000B (Section 8.6.2.4), if a surrogate recovery is not within specified limits and no instrument problem has been found, the sample must be reextracted and reanalyzed. Qualification of data due to this deficiency is addressed in the subsequent Organic Data Qualifiers section.
- 5. In the semivolatile fraction, low Coefficients of Determination (CODs) were observed for methapyriline and 4-nitroquinoline-1-oxide in the initial calibration performed on 11/15-11/16/01 on instrument A4HP8. According to SW-846 Method 8000B (Section 8.3.2), the COD for a non-linear curve must be ≥0.99. No positive results for these compounds were observed in the project samples; therefore, qualification of data was not warranted.
- 6. In the pesticide fraction, a high breakdown (>15%) of endrin was observed in the performance evaluation mixture (PEM) performed on 11/14/01 at 16:12 on column "B" of instrument A2HP3. According to SW-846 Method 8081A (Section 8.4.6), if degradation of either DDT or endrin exceeds 15%, injector maintenance should be completed and the instrument should be recalibrated. Qualification of data was not warranted.
- 7. In the pesticide fraction, high percent differences (%Ds>15%), coupled with increasing sensitivity, were observed for toxaphene, isodrin, technical chlordane, chlorobenzilate, and diallate in the continuing calibration verifications (CCVs) performed on 11/14/01 and 11/15/01 on instrument A2HP3 and on 11/21/01 on instrument A2HP5. According to SW-846 Method 8081A (Section 7.5.2.3), if the %D exceeds ±15%, the laboratory is required to check the operating conditions and reinject another CCV; if the reinjection fails criteria, the instrument must be recalibrated. No reported positives were observed for the aforementioned compounds; therefore, qualification of data was not warranted.
- 8. In the pesticide fraction, high percent differences (%D>15%), coupled with decreasing sensitivity, were observed for kepone in the CCVs performed on 11/14/01 and 11/15/01 on instrument A2HP3 and on 11/21/01 on instrument A2HP5. According to SW-846 Method 8000B (Section 7.7.2), the %D must be less than ±15% before sample analyses may take place. Qualification of data is addressed in the subsequent Organic Data Qualifiers section.

Comments

1. In the PCB fraction, the laboratory did not provide any confirmation data for the reported positive results in samples 110801240 and 111001248. The laboratory stated in the Case Narrative that confirmation is only performed down to the reporting limit (RL). The

reported positive results in samples 110801240 and 111001248 are below the RL. Although the method requires confirmation of positive results on a second column or by another means, such as MS, the client was informed of the laboratory's practice of not confirming results below the RL and concluded that the low-level results are acceptable as reported because PCBs are not a contaminant of concern for this project.

- 2. In the PCB fraction, the laboratory did not provide RT window summaries. The data reviewer used the associated raw data to evaluate the RTs for the reported positive results in the samples relative to the RT windows established by the initial calibration and found the RTs to be within the acceptance limits.
- 3. In the volatile fraction, the laboratory did not perform MS/MSD analyses on any of the project samples; therefore, the data reviewer could not evaluate the accuracy and precision of the analytical method relative to the project-specific sample matrices.
- 4. According to Method 8260B (Section 7.4.7), the laboratory is required to compare the internal standard area counts and RTs in the continuing check standard against those in the mid-point standard of the initial calibration. The laboratory did not provide documentation that this check had been performed. The data reviewer compared the internal standard area counts and RTs between the initial and continuing calibration standards. All RTs for the internal standards in the continuing calibration standard were within the method-specified QC range of ±30 seconds from the RTs in the initial calibration standard, and the area counts for the internal standards in the continuing calibration standard were within the limits of –50% to +100% of the area counts of the initial calibration standard.
- 5. The laboratory used 25 μ L/5 mL per injection for sample 110801236 due to the presence of high levels of target compounds. In addition, the laboratory analyzed samples 110801239, 110801240, and 111001248 using 100 μ L/5mL per injection due to the presence of high levels of target compounds. The laboratory raised the quantitation limits for all compounds on the analytical result summaries (Form I's) accordingly.
- 6. In the dioxin/furan analysis, the laboratory did not provide any mass calibration and tuning data for the mass spectrometer used for the analysis.

With respect to data usability, the principal areas of concern are blank contamination, calibration issues, low blank spike recoveries, low surrogate compound recoveries, and reported results below the quantitation limit. Based on a rigorous review of the data provided, the following organic data qualifiers are offered. The following organic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Organic Data Qualifiers

- Due to trace-level presence of the following compounds in the trip blanks and/or laboratory blanks, the reported positive results for these compounds in the samples listed should be considered "not-detected" and have been flagged "U*" on the data tables. When the reported result for the compound was less than the sample-specific quantitation limit, the data reviewer raised the reported result to the quantitation limit and flagged the result "U*". It should be noted that dilution factors, sample weights, and percent solids were taken into consideration when evaluating blank contamination.

Compound(s)

Sample(s) With Qualitatively
Questionable Positive Results ("U*")

acetone

110801236, 110801237, 110801238, 110801239, 110801240, 110801241, 110901242, 110901243, 110901244, 110901245, 111001247, and 111001248

toluene, 2-butanone, and xylenes (total)

110801239

methylene chloride, tetrachloroethene, and xylenes (total)

111001248

methylene chloride

110801239, 110801240, 110901242, 110901244, 110901245, and 111001247

The analyses for the following compounds in the samples indicated should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low (<0.050) average relative response factors were observed for these compounds in the associated initial multipoint calibration and/or CCV standards.

Compounds

Samples With Unreliable Analyses ("R")

acetonitrile and propionitrile

110801236, 110901243, 111001247, and 111001248

acrolein and isobutanol

110801236, 110901243, 111001248, 111001247, 110801237, 110801238, 110801241, 110901242, 110901244, 110901245, 110801239, and 110801240

acrolien, acetonitrile, propionitrile, and isobutanol

Trip Blank (COC#076403) and Trip Blank (COC#076412)

- The analyses for all acid semivolatile compounds in samples 110801237 and 110801237RE should be considered unreliable and have been flagged "R" on the data tables. Very low recoveries (<10%) were observed for the surrogate 2,4,6-tribromophenol in these sample analyses.
- The quantitation limits for all acid semivolatile compounds in sample 110801238 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. A low recovery (10%<%R<30%) was observed for the surrogate 2,4,6-tribromophenol in these sample analyses.

- The quantitation limits for all volatile compounds in samples 110801236, 110801239, and 110801240 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables (unless previously flagged "R"). In addition, the reported positive results for volatile compounds in these samples should be considered estimated and have been flagged "J" on the data tables (unless previously flagged "U*"). Low recoveries (10%<%R< 70%) were observed for two or more volatile surrogate compounds in the samples.
- The quantitation limits for the following compounds in the samples listed below may be higher than reported, and the "not-detected" results for these compounds have been flagged "UJ" on the data tables (unless previously flagged "R"). In addition, the positive results for acetone in sample 111001248 and for chloromethane in sample 110801236 should be considered estimated and have been flagged "J" on the data tables (unless previously flagged "U*"). High %Ds (>20%), coupled with decreases in instrument sensitivity, were obtained in the associated continuing calibrations.

<u>Compounds</u>	Sample(s) With Biased Low Quantitation Limits ("UJ")
dichlorodifluoromethane, bromomethane, chloroethane, acrolein, and vinyl acetate	110801236
dichlorodifluoromethane, chloromethane, bromomethane, chloroethane, acrolein, and vinyl acetate	110901243
bromomethane, chloroethane, and carbon tetrachloride	111001248
dichlorodifluoromethane, chloromethane, bromomethane, chloroethane, and acrolein	111001247
bromomethane, chloroethane, propionitrile, and isobutanol	11080123 7 , 11080123 8 , 11080124 1 , 110901242, 110901244, and 110901245
chloroethane, trichlorofluoromethane, acrolein, and propionitrile	Trip Blank (COC#076412)
bromomethane and trichlorofluoromethane	110801239 and 110801240

The quantitation limits for the following semivolatile compounds in the samples listed below may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged "R") on the data tables. High %Ds (>20%), coupled with a decrease in instrument sensitivity, were obtained between the average RRFs of the initial calibration and the RRFs from the associated CCV standards.

Compound(s)

bis(2-chloro-1-methylethyl) ether, a,a-dimethylphenethylamine, 4-nitroaniline, and p-phenylenediamine Sample(s) With Biased Low Quantitation Limits ("UJ")

110801236, 110801237, 110801238, 110801239, 110801240, 110801241, 110901242, 110901243, 110901244, and 110901245

methapyriline

All validated samples

The quantitation limits for the following semivolatile compounds in the samples listed below may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged "R") on the data tables. Low recoveries (10≤%R<50%) were observed for these compounds in the associated LCS and/or LCSD analyses.

Compound(s)

2,4-dinitrophenol, 4-chloroaniline, and 4,6-dinitro-2-methylphenol

Sample(s) With Biased Low Quantitation Limits ("UJ")

110801236, 110801237, 110801238, 110801239, 110801240, 110801241, 110901242, 110901243, 110901244, and 110901245

2,4-dinitrophenol

3.3'-dichlorobenzidine

110801237RE

All validated samples

The quantitation limits for the following compounds in the samples listed below may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. Low recoveries (<70%) were observed for these compounds in the associated LCS and/or LSCD analyses.

Compound(s)

bromomethane, dibromochloromethane, bromoform, chloroethane, and *trans*-1,3-dichloropropene

Sample(s) With Biased Low Quantitation Limits (Flagged "UJ")

110801236, 110801239, and 110801240

chloromethane

110901243

chloromethane, vinyl chloride, chloroethane, and carbon disulfide

111001248

acetone

Trip Blank (COC#076403) and Trip Blank (COC#076412)

The reported positive results for acetone in samples 110801237, 110801238, 110801241, 110901242, 110901244, 110901245, 111001247, and 111001248 should be considered estimated and have been flagged "J" on the data tables (unless

previously flagged "U*"). High recoveries (>130%) were observed for acetone in the associated LCS and/or LCS duplicate samples.

- The quantitation limits for kepone in all samples, except samples 111001247 and 111001248, may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. High %Ds (>15%), coupled with a decrease in instrument sensitivity, were obtained between the true concentrations from the initial calibrations and the observed concentrations in the associated CCV standards.
- The quantitation limits for endrin aldehyde in all samples, except samples 110801236, 111001247, and 111001248, may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. High %Ds (>15%), coupled with a decrease in instrument sensitivity, were obtained between the average RRFs of the initial calibration and the RRFs from the associated CCV standards.
- The positive result for endrin in sample 110801237 should be considered estimated and has been flagged "J" on the data tables. A high %D (>40%) was observed between the positive results for the compound in the two-column pesticide analysis of the sample.
- Per US EPA reporting requirements, all positive results reported at levels less than the quantitation limits (adjusted for dilutions) should be considered estimated and have been flagged "J" on the data tables.

A complete support document of this organic QA review is provided in Section 3 of this report.

B. Inorganic and General Chemistry Data

The inorganic and general chemistry analyses of 16 solid samples (including QC samples) were performed by STL of North Canton, Ohio. Fourteen samples (including QC samples) were analyzed for select metals by SW-846 Methods 6010B and 7471A; 14 samples (including QC samples) were analyzed for cyanide by SW-846 Method 9012A; and 16 samples (including QC samples) were analyzed for acid-soluble sulfide by SW-846 Method 9030A. These analyses are indicated on Table 1. The analytical results are summarized in Section 2 of this report.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, LCS results and recoveries, matrix spike/matrix spike duplicate recoveries and precision, contract-required detection limit (CRDL) standard recoveries, interference check standard results and recoveries, serial dilution results, initial and continuing calibrations, analytical sequence, and quantitation of positive results.

A few deficiencies were identified as detailed below. The Environmental Standards data reviewer has edited the laboratory-reported data and QC summary forms based on the deficiencies and comments listed in this QA review. Furthermore, the Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Inorganic and General Chemistry Data Support Documentation (Section 4) of

this review. The following deficiencies and comments do not necessarily affect data usability. Usability is addressed in the subsequent Inorganic and General Chemistry Data Qualifiers section.

Correctable Deficiencies

- 1. The laboratory did not calculate the serial dilution percent difference for thallium on the Serial Dilution RPD Report (Form IX). The data reviewer calculated the percent difference for thallium. Qualification of data was not warranted due to this issue.
- 2. In the sulfide fraction, the laboratory reported the true value on the Sulfide Logsheet for the LCS analyzed on 11/14/01 as "11,000 mg/kg". According to the Sulfide Logsheet for 11/16/01 and the associated Laboratory Control Sample Data Report, the true value for the LCS analyzed on 11/14/01 is 1000 mg/kg.
- 3. In the cyanide fraction, the laboratory did not summarize the results or recoveries for the initial and continuing calibration verifications (ICVs/CCVs), the initial and continuing calibration blanks (ICBs/CCBs), and the CRDL standards. The data reviewer was able to evaluate the ICV/CCV, ICB/CCB, and CRDL standards results based on the raw data provided. All results were within acceptance criteria; consequently, qualification of data was not warranted due to this issue.

Noncorrectable Deficiency

- Several sample coolers were received at STL North Canton at a temperature less than 2.0°C. According to SW-846 (Section 2, Table 2-36), samples are to be preserved at a temperature of 4±2°C. STL North Canton did not indicate that any samples were frozen or that any sample containers were broken; therefore, qualification of data was not warranted due to this issue.

Comments

- 1. The laboratory did not report the concentrations for the interference analytes (aluminum, calcium, iron, and magnesium) on the Interference Check Standard summary forms (Form IVs) for the metals analytical sequences; this omission was presumably because these analytes were not target analytes. The data reviewer obtained the essential ICP interferent information from the raw data provided. Qualification of data due to ICP interferences is address in the subsequent Inorganic and General Chemistry Data Qualifiers section.
- 2. The laboratory did not record final volumes for the project or QC samples on the Metals Prep Logs; however, the data reviewer was able to determine the final volume based on the reported positive results.

3. Sample 110801236 was analyzed at a 100-fold dilution due to high concentrations of lead and tin. Sample 110801237 was analyzed at a 100-fold dilution due to a high concentration of tin.

With respect to data usability, the principal areas of concern are blank contamination; ICP interferences; low, very low, and high recoveries in the MS and/or MSD analyses; imprecision in the MS/MSD analyses; and low and high recoveries in the CRDL standard analyses. Based on a rigorous review of the data provided, the following inorganic data qualifiers are offered. The following inorganic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Inorganic and General Chemistry Data Qualifiers

Due to trace level presence of the following analytes in the associated laboratory blanks, the positive results for the following analytes in the samples listed below should be considered "not-detected"; consequently, these results have been flagged "U*" on the data tables. It should be noted that dilution factors and sample weights were taken into consideration when evaluating blank contamination.

	Samples With Result(s) Qualified as "Not-Detected"
<u>Analyte</u>	
beryllium	110801236, 110801237, 110801239, 110801240, 110801241, and 110901242
mercury	110801236, 110801238, 110801240, 110801241, 110901242, 110901243, 110901244, 111001247, and 111001248
cadmium	110801238, 110801239, 110801241, 110901243, 110901244, 110901245, and 111001248
seleniu m	11080123 8 , 11080123 9 , 11080124 0 , 110801241, 110901243, 1109 0 1244, and 110901245
tin	110801238, 110801239, 110801241, 110901242, 110901243, 110901244, 110901245, 111001247, and 111001248

The analyses for antimony and selenium in all validated samples should be considered unreliable and have been flagged "R" (unless previously flagged 'U*") on the data tables. In addition, the reported positive results for these analytes in the validated samples should be considered estimated and have been flagged "J" on the data tables. Very low recoveries (%R<30%) were observed for antimony and selenium in the associated MS and/or MSD analyses.

- The reported positive result for zinc in sample 110801236 should be considered estimated and has been flagged "J" on the data tables. Zinc was observed to be present in the ICP interference check sample ICSA solution at a concentration greater than two-times the IDL, indicating a possible positive interference in the presence of high levels of interferents. High levels of ICP interferent(s) (instrument level > 50% of the true value of the ICSA solution) were observed in sample 110801236.
- The reported positive result for tin in sample 110801239 should be considered estimated and has been flagged "J" (unless previously flagged "U*") on the data tables. Tin was observed to be present in the ICP interference check sample ICSA solution at a negative concentration with an absolute value greater than two-times the IDL, indicating a possible negative interference in the presence of high levels of interferents. High levels of ICP interferent(s) (instrument level > 50% of the true value of the ICSA solution) were observed in sample 110801239.
- The detection limits for the following analytes in the samples listed below may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged 'U*" or "R") on the data tables. In addition, the reported positive results for the following analytes in the samples listed below should be considered estimated and have been flagged "J" on the data tables. Low recoveries (30≤%R<75%) were observed for these analytes in the associated MS and/or MSD analyses.

Analytes

antimony, cadmium, silver, arsenic, thallium, and mercury Samples With Biased Low Detection Limits ("UJ") and/or With Estimated Positive Results ("J")

All validated samples

- The reported positive result for silver in sample 110801236 should be considered estimated and has been flagged "J" on the data tables. A high recovery (>125%) was observed for silver in the associated MSD analysis.
- The reported positive result for silver in sample 110801236 should be considered estimated and has been flagged "J" on the data tables. A high relative percent difference (>40%) was observed for silver in the associated MS/MSD analyses.
- The positive results for antimony in samples 110801240 and 110901242 and for thallium in sample 110801239 should be considered estimated and have been flagged "J" on the data tables. In addition, the detection limits for thallium in samples 110801237, 110801238, 110801240, 110801241, 110901242, 110901243, 110901244, 110901245, 111001247, and 111001248 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. A low recovery (<85%) for thallium and a high recovery (>115%) for antimony were reported in the CRDL standards associated with the project samples.

A complete support document of this inorganic and general chemistry QA review is provided in Section 4 of this report.

C. Conclusions

This QA review has identified several aspects of the data that required qualification. The analytical data should be considered acceptable for use unless otherwise indicated in the QA review. In order to use any of the data, the data user should understand the qualifications and limitations specified in this QA review. The Project Chain-of-Custody Records and Case Narratives are presented in Section 5. Project Correspondence is presented in Section 6.

Report prepared by:

Thomas H. Weinmann Quality Assurance Chemist

Report prepared by:

Kathyryn A. Donahower Quality Assurance Chemist

Report reviewed by:

Donald J. Lancaster, M.S.

Senior Quality Assurance Chemist II

ENVIRONMENTAL STANDARDS, INC. 1140 Valley Forge Road P.O. Box 810 Valley Forge, PA 19482-0810

(610) 935-5577

Report prepared by:

Glenn S. Esler

Quality Assurance Chemist

g 5. L

Report prepared by:

Steven J. Lennon

Quality Assurance Chelmist

Report reviewed and approved by:

Puto & Forman for:
Rock J. Vitale, CEAC, CPC

Technical Director of Chemistry/

Principal

Date: 5/10/02



October 5, 2001

Mr. Mark P. Hemingway Principal Hydrogeologist Geomatrix Consultants 1214 West Sixth Street Suite 201 Austin, TX 78703

Dear Mr. Hemingway:

Enclosed is the quality assurance review for the soil and aqueous samples collected on March 11, 13, and 14, 2001, as part of the Morton – Reading, Ohio Project. Organic sample data were qualified as unreliable due to calibration issues, surrogate compound recoveries, and very low laboratory control sample recoveries. In addition, organic sample data were qualified as estimated due to calibration issues, low laboratory control sample recoveries and imprecision, and reported results below the quantitation limit. Inorganic sample data were qualified as estimated due to blank contamination, contract-required detection limit standard recoveries, matrix spike/matrix spike duplicate recoveries, laboratory control sample/laboratory control sample duplicate recoveries, and instrumental bias observed in the method blanks.

With respect to data package deliverables, the laboratory provided sufficient quality control summary forms and supporting raw data to allow for complete validation of the data. Only minor correctable deficiencies were noted during the review of the data.

If you have any questions or comments, or if we can be of further assistance, please feel free to call.

Sincerely,

Donald J. Lancaster, M.S.

Senior Quality Assurance Chemist II/

Project Manager

DJL/RJV:hm/hb

Enc.

Sincerely,

Rock J. VHtale, CEAC, CPC

Technical Director of Chemistry/

Principal



QUALITY ASSURANCE REVIEW OF SAMPLES COLLECTED ON MARCH 11, 13, AND 14, 2001 AS PART OF THE MORTON – READING, OHIO PROJECT

October 5, 2001

Prepared for:

GEOMATRIX CONSULTANTS

1214 West Sixth Street Suite 201 Austin, TX 78703

Prepared by:

ENVIRONMENTAL STANDARDS, INC.

1140 Valley Forge Road P.O. Box 810 Valley Forge, PA 19482-0810

ENVIRONMENTAL STANDARDS

www.EnvStd.com

TABLE OF CONTENTS

Introduction

Section 1	Quality Assurance Review					
	A.	Organic Data				
	B.	Inorganic Data and General Chemistry Data				
	C.	Conclusions				
Section 2	Analy	rtical Results				
Section 3	Organic Data Support Documentation					
Section 4	Inorganic and General Chemistry Data Support Documentation					
Section 5	Proje	ct Chain-of-Custody Records and Case Narratives				
Section 6	Proje	ct Correspondence				

Introduction

This quality assurance (QA) review is based upon a rigorous examination of the data generated from the analyses of the samples collected on March 11, 13, and 14, 2001, as part of the Morton – Reading, Ohio Project. The samples included in this QA review are presented on Table 1. The laboratory was requested to prepare a detailed data package to substantiate the reported analytical results. The data package that was prepared allowed for the performance of a comprehensive review.

This review has been performed with guidance from the "National Functional Guidelines for Organic Data Review" (US EPA, October 1999) and the "National Functional Guidelines for Inorganic Data Review" (US EPA, February 1994).

The reported analytical results are presented as a summary of the data in Section 2. Data were examined to determine the usability of the analytical results and compliance relative to the analytical requirements specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition" (SW-846) and the Quality Assurance Project Plan Facility Investigation RCRA §3013 Administrative Order for the Morton International, Inc. Facility located in Reading, Ohio. Qualifier codes have been placed next to the results to enable the data user to quickly assess the qualitative and/or quantitative reliability of any result. Details of this QA review are presented in Section 1 of this report. This critical QA review identifies data quality issues for specific samples and specific evaluation criteria. The data qualifications allow the data user to best understand the usability of the analysis results. Data not qualified in this report should be considered valid based on the quality control (QC) criteria that have been reviewed.

TABLE 1
SAMPLES THAT HAVE UNDERGONE
A RIGOROUS QUALITY ASSURANCE REVIEW

				Date	
Geomatrix Consultants	Laboratory			Sample	Parameter(s)
Sample Number	Sample Number	SDG	Matrix	Collected	Analyzed
031101019	A1C130135-001	A1C130135	Soil	3/11/01	V, SVOA, Pest, PCB, M¹, CN, AIS
031101020	A1C130135-002	A1C130135	Soil	3/11/01	pH, TOC
031101020DUP (Laboratory Duplicate)	A1C130135-002DUP	A1C130135	Soil	3/11/01	pН
031101021	A1C130135-003	A1C130135	Soil	3/11/01	V, SVOA, Pest, PCB, M¹, CN, AIS
031101022	A1C130135-004	A1C130135	Soil	3/11/01	pH, TOC
Trip Blank (COC032203)	A1C130135-007	A1C130135	Aq	3/11/01	V
031101023	A1C130135-005	A1C130135	Soil	3/11/01	pH, TOC
031101024	A1C130135-006	A1C130135	Soil	3/11/01	pH, TOC
031101024DUP (Laboratory Duplicate)	A1C130135-006DUP	A1C130135	Soil	3/11/01	pH, TOC
031301025	A1C140189-001	A1C130135	Soil	3/13/01	V, SVOA, Pest, PCB, M¹, CN, AIS
031301025MS (Matrix Spike)	A1C140189-001M S	A1C130135	Soil	3/13/01	AIS
031301025SD (Matrix Spike Duplicate)	A1C140189-001SD	A1C130135	Soil	3/13/01	AIS
031301026	A1C140189-002	A1C130135	Soil	3/13/01	V, SVOA, Pest, PCB, M ¹ , CN, AIS
031301027	A1C140189-003	A1C130135	Soil	3/13/01	pH, TOC
031301028	A1C140189-004	A1C130135	Soil	3/13/01	pH, TOC

TABLE 1 (Cont.)

					·
Geomatrix Consultants Sample Number	Laboratory Sample Number	SDG	Matrix	Date Sample Collected	Parameter(s) Analyzed
031301028DUP (Laboratory Duplicate)	A1C140189-004DUP	A1C130135	Soil	3/13/01	рН
031301029	A1C140189-005	A1C130135	Aq	3/13/01	V, SVOA, Pest, PCB, M ¹ , CN, AIS
031301029-RE (Reanalysis)	A1C140189-005	A1C130135	Aq	3/13/01	SVOA
Trip Blank (COC032205)	A1C140189-006	A1C130135	Aq	3/13/01	V
031401030	A1C150207-001	A1C130135	Aq	3/14/01	V*, SVOA*, Pest*, PCB, M², CN, S
Trip Blank (COC032206)	A1C150207-002	A1C130135	Aq	3/14/01	V*
031401031	A1C150207-003	A1C130135	Soil	3/14/01	V*, SVOA*, Pest*, PCB, D/F, M², CN, AIS
031401031MS (Matrix Spike)	A1C150207-003MS	A1C130135	Soil	3/14/01	D/F
031401031MSD (Matrix Spike Duplicate)	A1C150207-003MSD	A1C130135	Soil	3/14/01	D/F
031401032	A1C150207-004	A1C130135	Soil	3/14/01	V*, SVOA*, Pest*, PCB, D/F, M², CN, AIS
031401033	A1C150207-005	A1C130135	Soil	3/14/01	pH, TOC
031401033DUP (Laboratory Duplicate)	A1C150207-005DUP	A1C130135	Soil	3/14/01	рН, ТОС

NOTES:

V	-	TCL Volatile Organic Compounds by SW-846 Method 8260B.
---	---	--

Appendix IX Volatile Organic Compounds by SW-846 Method 8260B. TCL Semivolatile Organic Compounds by SW-846 Method 8270C. Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C. SVOA -

SVOA*-

TABLE 1 (Cont.)

NOTES (Cont.):

Pest - TCL Organochlorine Pesticides by SW-846 Method 8081A.

Pest* - Appendix IX Organochlorine Pesticides by SW-846 Method 8081A.

PCB - PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242,

Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082.

D/F - 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Select Total Dioxins and Furans by

SW-846 Method 8280A.

M¹ - TAL Metals by SW-846 Methods 6010B and 7471A.

M² - Select Metals (specifically, TAL metals plus tin and minus aluminum, calcium, iron, magnesium, manganese, potassium, and sodium) by SW-846 Methods 6010B

and 7471A.

CN - Cyanide by SW-846 Method 9012A.

AIS - Acid-insoluble Sulfide by SW-846 Method 9030A.

S - Total Sulfide by MCAWW Method 376.1.

TOC - Total Organic Carbon by EPA Method 415.1. pH - pH by SW-846 Method 9045C.

Aq - Aqueous.

Section 1 Quality Assurance Review

A. Organic Data

The organic analyses of eight soil samples and six aqueous samples were performed by Severn Trent Laboratories, Inc. of North Canton, Ohio. Seven samples were analyzed for TCL volatile organic compounds by SW-846 Method 8260B; four samples (including QC samples) were analyzed for Appendix IX Volatile Organic Compounds by SW-846 Method 8260B; six samples were analyzed for TCL Semivolatile Organic Compounds by SW-846 Method 8270C; three samples (including QC samples) were analyzed for Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C; five samples (including QC samples) were analyzed for TCL Organochlorine Pesticides by SW-846 Method 8081A; three samples were analyzed for Appendix IX Organochlorine Pesticides by SW-846 Method 8081A; and eight samples (including QC samples) were analyzed for PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082. In addition, samples were analyzed for 2,3,7,8-tetrachlorodibenzo-p-dioxin, total tetrachlorodibenzo-p-dioxins (TCDD), total pentachlorodibenzo-p-dioxins (PeCDD), total hexachlorodibenzo-p-dioxins (HxCDD), total tetrachlorodibenzo-p-furans (TCDF), total pentachlorodibenzo-p-furans (PeCDF), and total hexachlorodibenzo-p-furans (HxCDF) by the STL facility in West Sacramento, California. These analyses are indicated on Table 1 and the analytical results are summarized in Section 2 of this report.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, system monitoring compound recoveries, blank spike recoveries and precision, initial and continuing calibrations, target compound matching quality, analytical sequence, retention times, gas chromatography/mass spectroscopy (GC/MS) tuning and mass calibration, internal standard performance, quantitation of positive results, and overall system performance.

A few deficiencies were identified as detailed below. The Environmental Standards, Inc. (Environmental Standards) data reviewer has edited the laboratory-reported data and QC summary forms based on the deficiencies and comments listed in this QA review. Furthermore, the Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Organic Data Support Documentation (Section 3) of this review. The following deficiencies and comments do not necessarily affect data usability. Usability is addressed in the subsequent Organic Data Qualifiers section.

Correctable Deficiencies

1. In the volatile fraction, the laboratory incorrectly reported the initial calibration dates, times, and/or file IDs on several of the calibration summary forms.

- 2. For the semivolatile fraction, the initial calibration starting date and time reported on the Initial Calibration Data summary forms (Form VIs) and the associated Continuing Calibration Compounds summary forms (Form VIIs) for instrument A4HP7 did not correspond to the starting calibration dates and times in the associated raw data. In addition, the initial calibration file names reported on the Form VI did not match the raw data file names.
- 3. For the pesticide and PCB fractions, the initial calibration dates and times reported on the Initial Calibration Data forms, the associated Continuing Calibration Compounds forms, and on the associated Pesticide Analytical Sequence summaries (Form VIIIs) did not correspond to the calibration dates and times from the associated raw data.
- 4. For the pesticide fraction, the laboratory did not report the Performance Evaluation Mixtures (PEMs) analyzed on 3/16/01 at 00:46 and on 3/18/01 at 12:42 on the associated Form VIIIs.
- 5. For the pesticide fraction, the laboratory did not perform alternate calibration for the compounds 4,4'-DDT and methoxychlor that exhibited relative standard deviations (RSDs) greater than 20% for the calibration factors from the initial calibration analyzed on 3/26/01. According to SW-846 Method 8081A (Section 7.4.5.3), if the RSD of the calibration factor is greater than 20%, the analyst must use a calibration curve or a non-linear calibration model for quantitation. The compounds 4,4'-DDT and methoxychlor were not detected in the project samples; therefore, qualification of data was not warranted due to this issue.
- 6. For the pesticide fraction, the laboratory reported the concentration for kepone on the Continuing Calibration Compounds summary form for the continuing calibration analyzed on 3/18/01 at 11:58 as "0.00423 ng". According to the raw data, the concentration for kepone for the continuing calibration analyzed on 3/18/01 at 11:58 is 0.05979 ng. The data reviewer recalculated the percent drift for kepone on the aforementioned Continuing Calibration Compounds summary form based on the raw data. Qualification of data due to this issue is addressed in the subsequent Organic Data Qualifiers section.
- 7. For the pesticide and PCB fractions, the laboratory did not report the RPDs between LCS and LCSD results on the Check Sample Duplicate Recovery forms. The data reviewer was able to calculate the RPDs from the data provided. All RPDs for the target compounds were acceptable.
- 8. For the pesticide fraction, the laboratory reported the lower of the endrin aldehyde results obtained from the two chromatographic columns used for analysis for sample 031401032. According to SW-846 Method 8000 (Section 7.10.4.2), if the RPD between the results obtained from separate chromatographic columns is greater than 40% and there is no

- evidence of chromatographic problems, the higher result should be reported. Qualification of data due to this issue is addressed in the subsequent Organic Data Qualifiers section.
- 9. The laboratory reported an incorrect date of analysis on the summary report for sample 031401032 for the dioxin and furan analyses. The summary form indicates that the sample was analyzed on 3/22/01; however, the raw data indicate that this sample was analyzed on 3/23/01.
- 10. The laboratory used an acceptance range of 1.24-1.78 for the mass ratios for 1,2,3,7,8-pentachlorodibenzo-p-dioxin and 1,2,3,7,8-peCDF. According to SW-846 Method 8280A (Table 9), the laboratory should have used an acceptance range of 1.32-1.78. The data reviewer reviewed all mass ratios and determined that all ratios were within the method criterion.
- 11. The laboratory analyzed closing calibration standards as part of the analytical run for dioxins and furans, but the results of these continuing calibrations were not summarized on quality control forms. The data reviewer summarized the results of the closing calibration standards and used the results to qualify data if necessary.

Noncorrectable Deficiencies

- 1. The sample cooler received by the laboratory on 3/14/01 had a temperature of 1.2°C according to the STL Cooler Receipt Form. The laboratory did not indicate that any samples were received frozen or that any sample containers were broken; therefore, qualification of data was not warranted due to this deficiency.
- 2. In the volatile fraction, the results for several target compounds were outside of the control limits in the blank spike/blank spike duplicate analyses and the laboratory did not reanalyze the associated samples. According to SW-846 Method 8000B (Section 8.7.4), the laboratory should correct the system and reanalyze the associated samples when blank spike results are outside of the control limits. The impact on data usability due to the out of control blank spike results is addressed in the subsequent Organic Data Qualifiers section.
- 3. In the volatile fraction, En Core® samples 031101019 and 031101021 were received by the laboratory approximately 1 hour beyond the recommended holding time. According to SW-846 Method 5035 (Section 6.2.1.8), En Core® samples should be transferred into a 40-mL vial with methanol, bisulfate, and water within 48 hours of collection. Samples 031101019 and 031101021 were collected on 3/11/01 at 0930 and 0955, respectively. The samples were received by the laboratory at 1030 on 3/13/01. The samples were analyzed within the required 14 days of collection; therefore, qualification of data was not warranted due to this deficiency.

- 4. For the semivolatile fraction, the laboratory analyzed samples after invalid initial calibration curves (*i.e.*, coefficient of determination [COD] < 0.99) were generated for the compounds 2-nitrophenol, fluorene, 2,4-dinitrophenol *a,a*-dimethylphenethylamine; *p*-phenylenediamine; and hexachlorocyclopentadiene in the initial calibration initiated on 3/06/01 at 17:32 on instrument A4HP9. In addition, the laboratory analyzed samples after invalid initial calibration curves (COD < 0.99) were generated for the compounds *a,a*-dimethylphenethylamine; *p*-phenylenediamine; and 3,3'-dimethylbenzidine in the initial calibration initiated on 3/21/01 at 09:24 on instrument A4HP9. According to SW-846 Method 8000B (Section 7.5.3), when a non-linear curve is utilized, the COD must be greater than or equal to 0.99. Data were not affected by this issue because positive results were not reported for these compounds in the project samples.
- 5. For the pesticide fraction, the laboratory analyzed samples after invalid calibration verifications (*i.e.*, percent differences and/or percent drifts > 15%) analyzed on 3/16/01 at 12:12, on 3/18/01 at 11:58, on 3/19/01 at 01:13, on 3/19/01 at 10:46, on 3/19/01 at 14:28, on 3/19/01 at 14:50, and on 3/22/01 at 11:24. According to SW-846 Method 8081A (Section 7.5.2.3), if the calibration response for an analyte is not within ±15%, a new initial calibration must be prepared. Qualification of data due to this issue is addressed in the subsequent Organic Data Qualifiers section.

Comments

- 1. In the volatile fraction, sample Trip Blank (COC032205; collected on 3/13/01) was not requested for volatile organic analysis on the Chain-of-Custody Record. The data reviewer assumed that the request for volatile organic analysis of this sample was inadvertently omitted.
- 2. In the volatile fraction, the laboratory did not perform MS/MSD analyses on any of the project samples; therefore, the data reviewer could not evaluate the accuracy and precision of the analytical method relative to the project-specific sample matrices.
- 3. The quantitation limits for volatile organic compounds in sample 031401031 are elevated due to the increased extract and injection volumes used for analysis.
- 4. For the semivolatile fraction, the laboratory did not apply an alternate initial calibration option (*i.e.*, linear or quadratic) when the RSD for the compound famphur was greater than 15% in the initial calibration performed on instrument A4HP9 on 3/21/01 from 09:24 to 15:15. According to SW-846 Method 8270C (Section 7.3.7.1), alternate calibration options must be applied for any compound with a RSD greater than 15%. There were no reported positive results for famphur; consequently, qualification of data was not warranted due to this issue.

- 5. For the semivolatile fraction, the laboratory reported the compounds 2,2'-oxybis(1-chloropropane); 1,3-dinitrobenzene; and thionazin on the Form I's and these same compounds as bis(2-chloroisopropyl)ether, m-dinitrobenzene, and zinophos, respectively, on the Initial Calibration Data and Continuing Calibration Compounds summaries. The data reviewer reported these compounds on the data tables as the compounds were reported on the Form I's.
- 6. For the semivolatile fraction, the laboratory analyzed a 24-ppb continuing calibration standard on instrument A4HP6 on 3/20/01 at 08:12. The same instrument analyzed a 16-ppb continuing calibration standard in an associated sequence. All other instruments utilized 16-ppb continuing calibrations. There is no true "midpoint" standard concentration to utilize for continuing calibration standards because there were six standards analyzed in the initial calibration.
- 7. For the semivolatile fraction, sample 031401032 was analyzed at a 50-fold dilution due to matrix interference. The quantitation limits in this sample were raised accordingly.
- 8. For the semivolatile fraction, the laboratory did not report acetophenone; atrizine; benzaldehyde; 1,1'-biphenyl; and caprolactum in the LCS analyses. According to the laboratory, these compounds are not in the LCS spiking mixture and, therefore, are not on the LCS forms. The laboratory is in the process of adding these five compounds to the spiking solution.
- 9. For the pesticide fraction, sample 031301026 was analyzed at a five-fold dilution, sample 031401031 was analyzed at a four-fold dilution, and sample 031401032 was analyzed at a 40-fold dilution due to matrix interferences in these samples. The quantitation limits for these samples were raised accordingly.
- 10. For the pesticide fraction, Environmental Standards requested a number of deliverables (related to the Case Narratives, initial calibrations, and RT windows) that were missing from the data package. The laboratory's responses to these requests have been included in the Project Correspondence (Section 6).
- 11. For the pesticide fraction, the laboratory appeared to have quantitated the PEM analyzed on the secondary column on 3/19/01 at 21:51 against an incorrect method file. Upon Environmental Standards' inquiry, the laboratory stated that there was a software error and confirmed that the aforementioned PEM was quantitated against the correct method file.
- 12. For the PCB fraction, sample 031401032 was analyzed at a 50-fold dilution due to matrix interference. Sample 031401030 was analyzed at a five-fold dilution due to a high concentration of a target compound. The quantitation limits in these samples were raised accordingly.

With respect to data usability, the principal areas of concern are calibration issues, low blank spike recoveries and imprecision, and reported results below the quantitation limit. Based on a rigorous review of the data provided, the following organic data qualifiers are offered. The following organic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Organic Data Qualifiers

- Although not qualified due to blank contamination, the positive results for acetone in samples 031101019, 03130126, and 031401032, and for methylene chloride in samples 031301025 and 031301026 should be used with caution. These compounds are very common laboratory contaminants and were observed in the aforementioned samples at low concentrations.
- The analyses for acrolein, acetonitrile, propionitrile, and isobutanol in samples 031401030, 031401031, 031401032, and Trip Blank (COC032206) should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low relative response factors (RRFs <0.050) were observed for these compounds in the associated initial and/or continuing calibration standards. It should be noted that the RRFs are a function of not only the instrument response for the compound but also of the instrument response for the associated internal standard. If the laboratory had used an internal standard that more closely matched the instrument response for the target compound, the RRFs would have been acceptable and data would not be affected.
- The analysis for 4-chloroaniline in sample 031301029, for hexachlorocyclopentadiene in the reanalysis of sample 031301029, and for hexachlorocyclopentadiene in sample 031401030 should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low percent recoveries (<10%) were observed for these compounds in the associated LCS analyses.
- The analysis for 4-nitroquinoline-1-oxide in sample 031401030 should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. A very low (<0.05) average relative response factor was observed for this compound in the associate initial multipoint calibration. It should be noted that the RRFs are a function of not only the instrument response for the compound but also of the instrument response for the associated internal standard. If the laboratory had used an internal standard that more closely matched the instrument response for the target compound, the RRFs would have been acceptable and data would not be affected.

- The analysis for all acid compounds in samples 031301029 and 031301029-RE should be considered unreliable, and the "not-detected" results have been flagged "R" on the data tables. Very low recoveries (<10%) were reported for the acid surrogate compound phenolds in the initial analysis and the reextraction/reanalysis of the sample for semivolatile organic compounds.
- The analysis for kepone in sample 031401030 should be considered unreliable, and the "not-detected" result has been flagged "R" on the data tables. A very high percent drift (>90%) was observed for kepone in the associated continuing calibration standard analysis.
- The quantitation limit for acetone in sample Trip Blank (COC032203) may be higher than reported, and the "not-detected" result has been flagged "UJ" on the data tables. A high percent drift (>20%), coupled with a decrease in instrument sensitivity, was obtained between the observed and expected concentrations in the associated continuing calibration standard.
- The quantitation limits for dichlorodifluoromethane in samples 031101019 and 031101021 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. A high percent difference (%D>20%), coupled with a decrease in instrument sensitivity, was obtained between the average RRF of the initial calibration and the RRF in the associated continuing calibration.
- The quantitation limits for acetone and acrolein in samples 031401030 and Trip Blank (COC032206) may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged "R") on the data tables. High %Ds (>20%), coupled with decreases in instrument sensitivity, were obtained between the average RRFs of the initial calibration and the RRFs in the associated continuing calibration.
- The quantitation limits for dichlorodifluoromethane and *trans*-1,3-dichloropropene in sample Trip Blank (COC032203) and for propionitrile, methylmethacrylate; 1,1,1,2-tetrachloroethane; and acetonitrile in sample 03141032 should be considered estimated, and the "not-detected" results have been flagged "UJ" on the data tables (unless previously flagged "R"). High percent differences in the direction of increased instrument sensitivity were observed for these compounds in the associated continuing calibration standard analyses. The quantitation limits for the compounds in the aforementioned samples may be acceptable as reported because the bias was in the direction of increased instrument sensitivity.
- The quantitation limits for acetone in samples 031101021 and 031301025; 2-butanone in samples 031101019 and 031101021; 2-butanone, 4-methyl-2-pentanone, and 2-hexanone in samples 031301025 and 031301026; and bromomethane, chloroethane, and carbon disulfide in sample 031401031 may be higher than reported, and the "not-detected" results

have been flagged "UJ" on the data tables. In addition, the reported positive results for acetone in samples 031101019 and 031301026 should be considered estimated and have been flagged "J" on the data tables. Low recoveries (<70%) were observed for these compounds in the associated LCS analyses.

- The reported positive result for acetone in sample 031301026 should be considered estimated and has been flagged "J" on the data tables. A high relative percent difference (>40%) was observed between the results for acetone in the associated LCS analyses.
- The quantitation limit for 3-nitroanaline in sample 031301029 and for diethylphthalate and dimethylphthalate in sample 031401030 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. Low recoveries (10%<%R<50%) were observed for these compounds in the associated LCS analyses.
- The quantitation limit for 4-nitrophenol in sample 031401030 should be considered estimated, and the "not-detected" result has been flagged "UJ" on the data tables (unless previously flagged "R"). A high percent difference (>20%) in the direction of increased instrument sensitivity was observed for this compound in the associated continuing calibration standard analysis. The quantitation limit for the compound in the aforementioned sample may be acceptable as reported because the bias was in the direction of increased instrument sensitivity.
- The quantitation limits for the compounds in the following samples may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged "R") on the data tables. High %Ds (>20%), coupled with decreases in instrument sensitivity, were observed for these compounds in the associated continuing calibration standards.

<u>Compounds</u>	Sample(s) With Biased Low Quantitation Limits ("UJ")
hexachlorocyclopentadiene; 3,3'-dimethylbenzidine; p-phenylenediamine; a,a-dimethyl-phenethylamine; 7,12-dimethylbenz(a)anthracene; and famphur	031401030
bis(2-chloroethyl)ether	031301025 and 031301026
4-nitrophenol and a,a-dimethyl-phenethylamine	031401031 and 031401032

- The reported positive result for endrin aldehyde in sample 031401032 should be considered estimated and has been flagged "J" on the data tables. A high difference (>±RL) was observed between the results obtained from the two chromatographic columns used in the analysis of this sample.
- The quantitation limits for the compounds in the following samples may be higher than reported, and the "not-detected" results have been flagged "UJ" (unless previously flagged "R") on the data tables. High %Ds (>15%), coupled with decreases in instrument sensitivity, were observed for these compounds in the associated continuing calibration standards.

Compound(s)

isodrin

kepone and diallate

Sample(s) With Biased Low Quantitation Limits ("UJ")

031401030

031401030, 031401031, and 031401032

- Per US EPA reporting requirements, all positive results reported at levels less than the quantitation limits (adjusted for dilutions) should be considered estimated and have been flagged "J" on the data tables.

A complete support document of this organic QA review is provided in Section 3 of this report.

B. Inorganic and General Chemistry Data

The general chemistry analyses of 19 solid samples (including QC samples) and two aqueous samples were performed by Severn Trent Laboratories, Inc. of North Canton, Ohio. Eight samples were analyzed for target analyte list (TAL) and select metals by SW-846 Methods 6010B and 7470A/7471A; eight samples were analyzed for cyanide by SW-846 Method 9012A; eight samples (including QC samples) were analyzed for acid-insoluble sulfide by SW-846 Method 9030A; two samples were analyzed for total sulfide by MCAWW Method 376.1; all samples were analyzed for pH by SW-846 Method 9045C; and eight samples were analyzed for total organic carbon by the MSA Walkley-Black Method. These analyses are indicated on Table 1. The analytical results are summarized in Section 2 of this report.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, LCS results and recoveries, contract-required detection limit (CRDL) standard recoveries, interference check standard results and recoveries, serial dilution results, initial and continuing calibrations, analytical sequence, and quantitation of positive results.

A few deficiencies were identified as detailed below. The Environmental Standards data reviewer has edited the laboratory-reported data and QC summary forms based on the deficiencies and comments listed in this QA review. Furthermore, the Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Inorganic Data Support Documentation (Section 4) of this review. The following deficiencies and comments do not necessarily affect data usability. Usability is addressed in the subsequent Organic Data Qualifiers section.

Correctable Deficiencies

- 1. The laboratory reported the spike amounts for silver, cobalt, chromium, and vanadium as "0.050," "0.50," "0.20," and "0.50," respectively, on the Laboratory Control Sample Data Report (Form VII) for LCS A1C150000-092. According to the raw data, the correct spike amounts for silver, cobalt, chromium, and vanadium are 50.0 μg/L, 500 μg/L, 200 μg/L, and 500 μg/L, respectively.
- 2. The laboratory did not calculate serial dilution percent differences on the Serial Dilution RPD Report (Form IX) for the positive results observed. The data reviewer calculated the percent differences, and all the percent differences were outside of acceptance criteria; however, the original sample results were less than 50 × the instrument detection limit (IDL). Qualification of data was not warranted due to this issue.
- 3. The laboratory reported the sample results for barium, beryllium, and zinc as "ND" (not-detected) on the Total Metals Analytical Summary Form (Form I) for sample 031401030. According to the raw data, the correct sample results for barium, beryllium, and zinc are 0.60 µg/L, 0.31 µg/L, and 3.1 µg/L, respectively.
- 4. In the cyanide fraction, the laboratory did not summarize the results or recoveries for the initial and continuing calibration verifications (ICVs/CCVs), the initial and continuing calibration blanks (ICBs/CCBs), and CRDL standards. The data reviewer was able to evaluate the ICV/CCV, ICB/CCB, and CRDL standards results based on the raw data provided. All results were within acceptance criteria; consequently, qualification of data was not warranted due to this issue.

5. In the cyanide fraction, the laboratory reported the QC sample analyzed in position 40 as "CCV" on the raw data for the analytical sequences performed on 3/23/01, 3/25/01, and 3/27/01. According to the raw data, the QC sample analyzed in position 40 was a CCB.

Noncorrectable Deficiency

One sample cooler was received at STL-North Canton at a temperature of 1.2°C. According to SW-846 (Section 2, Table 2-36), aqueous samples are to be preserved at a temperature of 4±2°C. STL-North Canton did not indicate that any samples were frozen or that any sample containers were broken; therefore, qualification of data was not warranted due to this issue.

<u>Comments</u>

- 1. The laboratory did not provide summary forms for the CRDL standard analyses. CRDL standard true values were reported in the mercury raw data but were not reported for the ICP metals fraction. Upon Environmental Standard's request, the laboratory stated that nominal spike concentrations for the ICP target analytes in the CRDL standards would be provided. This information was not provided by the laboratory; consequently, the data reviewer could not evaluate ICP metals data usability on the basis of CRDL standard results and recoveries.
- 2. The laboratory did not report the concentrations for several or all the interference analytes (aluminum, calcium, iron, and magnesium) on the Interference Check Standard summary forms (Form IVs) for the metals analytical sequences performed on 3/22/01; this omission was presumably because these analytes were not target analytes. The data reviewer obtained the essential ICP interferent information from the raw data provided and reviewed the concentrations of these analytes to determine any possible impact on data quality.
- 3. The laboratory did not record final volumes for the project or QC samples on the Metals Prep Logs; however, final volume information was reported on the Metals Preparation Summary sheet.
- 4. The laboratory did not provide the instrument runlog (Form XIV) for the ICP analytical sequence performed on 3/19/01. Upon Environmental Standard's request, the instrument runlog was provided and has been included in Section 6.
- 5. Sample 031301026 was analyzed at a 10-fold dilution due to high concentrations of the target compounds calcium and magnesium.



With respect to data usability, the principal areas of concern are blank contamination, significant negative instrument bias, low CRDL standard recoveries, low recoveries in MS/MSD analyses, and low recoveries in the LCS/LCSD analyses. Based on a rigorous review of the data provided, the following inorganic data qualifiers are offered. The following organic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Inorganic Data Qualifiers

- Due to trace level presence of the following analytes in the associated laboratory blanks, the positive results for the following analytes in the samples listed below should be considered "not-detected"; consequently, these results have been flagged "U*" on the data tables.

Analyte(s)	Sample With Result(s) Qualified as "Not-Detected"
beryllium	031301026
aluminum and manganese	031301029
barium, beryllium, and zinc	031401030
tin	031401031

- The detection limits for copper in samples 031301029 and 031401030 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. In addition, the reported positive result for aluminum in sample 031301029 should be considered estimated and has been flagged "J" on the data tables (unless previously flagged "U*"). Significant negative instrument bias (>2× the IDL) was observed for aluminum and copper in the associated laboratory blanks. Furthermore, the concentrations of aluminum and copper in the aforementioned samples were significantly less than the observed negative bias.
- The detection limits for mercury in samples 031301029 and 031401030 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. Low recoveries (<85%) were observed for mercury in the associated CRDL standard analyses.
- The detection limit for acid-insoluble sulfide in sample 031301025 may be higher than reported, and the "not-detected" result has been flagged "UJ" on the data tables. In addition, the reported positive results for acid-insoluble sulfide in samples 031301026, 031401031, and 031401032 should be considered estimated and have been flagged "J" on

the data tables. Low recoveries (10%<%R<75%) were observed for acid-insoluble sulfide in the associated MS/MSD analyses.

- The detection limit for total sulfide in sample 031301029 may be higher than reported, and the "not-detected" result has been flagged "UJ" on the data tables. Low recoveries (10%<%R<80%) were observed for total sulfide in the associated LCS/LCSD analyses.
- The detection limits for cyanide in samples 031301029 and 031401030 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. A low recovery (10%<%R<80%) was observed for cyanide in the associated LCS analysis.

A complete support document of this organic QA review is provided in Section 4 of this report.

C. Conclusions

This QA review has identified several aspects of the data that required qualification. The analytical data should be considered acceptable for use unless otherwise indicated in the QA review. In order to use any of the data, the data user should understand the qualifications and limitations specified in this QA review. The Project Chain-of-Custody Records are presented in Section 5. Project Correspondence is presented in Section 6.

Report prepared by:

Thomas H. Weinmann Quality Assurance Chemist

Showed A. Wein

Report reviewed by:

Donald J. Lancaster, M.S.

Senior Quality Assurance Chemist II

Report reviewed and approved by:

Rock J. Vitale, CEAC, CPC

Technical Director of Chemistry/

Principal

ENVIRONMENTAL STANDARDS, INC.

1140 Valley Forge Road

P.O. Box 810

Valley Forge, PA 19482-0810

(610) 935-5577

Date: 10/5/01



September 25, 2001

Mr. Mark P. Hemingway Principal Hydrogeologist Geomatrix Consultants 1214 West Sixth Street Suite 201 Austin, TX 78703

Dear Mr. Hemingway:

Enclosed is the quality assurance review for the aqueous samples collected on May 8, 2001, as part of the Morton – Reading, Ohio Project. Organic data were qualified as unreliable due to calibration issues and very low laboratory control sample recoveries. In addition, organic data were qualified as estimated due to calibration issues, a low laboratory control sample recovery, low recoveries in the matrix spike/matrix spike duplicate analyses, high surrogate compound recoveries, imprecision of reported results from two separate chromatographic columns, and reported results less than the quantitation limit. For the inorganics analyses, sample data were qualified as unreliable due to very low matrix spike/matrix spike duplicate recoveries. Inorganic data were qualified as estimated due to instrumental interferences and low matrix spike/matrix spike duplicate recoveries.

With respect to data package deliverables, the laboratory provided sufficient quality control summary forms and supporting raw data to allow for complete validation of the data. Several deficiencies were noted during the review of the data.

If you have any questions or comments, or if we can be of further assistance, please feel free to call.

Sincerely,

Sonald J. Lancaster, M.S.

_Senior Quality Assurance Chemist II/

Project Manager

DJL/RJV:hm

Enc.

Sincerely,

Rock J. Vitale, CEAC, CPC

Technical Director of Chemistry/

Daviel R. Bhy

Principal



QUALITY ASSURANCE REVIEW OF SAMPLES COLLECTED ON MAY 8, 2001 AS PART OF THE MORTON – READING, OHIO PROJECT

September 25, 2001

Prepared for:

GEOMATRIX CONSULTANTS

1214 West Sixth Street Suite 201 Austin, TX 78703

Prepared by:

ENVIRONMENTAL STANDARDS, INC.

1140 Valley Forge Road P.O. Box 810 Valley Forge, PA 19482-0810

ENVIRONMENTAL STANDARDS

www.EnvStd.com

TABLE OF CONTENTS

Introduction

Section 1	Qua	Quality Assurance Review		
	A.	Organic Data		
	B.	Inorganic Data		
	C.	General Chemistry Data		
Section 2	Ana	lytical Results		
Section 3	Org	anic Data Support Documentation		
Section 4	Inor	Inorganic and General Chemistry Data Support Documentation		
Section 5	Proj	ect Chain-of-Custody Records and Case Narratives		
Section 6	Proj	ect Correspondence		

Introduction

This quality assurance (QA) review is based upon a rigorous examination of the data generated from the analyses of the samples collected on May 8, 2001, as part of the Morton – Reading, Ohio Project. The samples included in this QA review are presented on Table 1. The laboratory was requested to prepare a detailed data package to substantiate the reported analytical results. The data package that was prepared allowed for the performance of a comprehensive review.

This review has been performed with guidance from the "National Functional Guidelines for Organic Data Review" (US EPA, October 1999) and the "National Functional Guidelines for Inorganic Data Review" (US EPA, February 1994).

The reported analytical results are presented as a summary of the data in Section 2. Data were examined to determine the usability of the analytical results and compliance relative to the analytical requirements specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition" (SW-846) and the Quality Assurance Project Plan Facility Investigation RCRA §3013 Administrative Order for the Morton International, Inc. Facility in Reading, Ohio. Qualifier codes have been placed next to the results to enable the data user to quickly assess the qualitative and/or quantitative reliability of any result. Details of this QA review are presented in Section 1 of this report. This critical QA review identifies data quality issues for specific samples and specific evaluation criteria. The data qualifications allow the data user to best understand the usability of the analysis results. Data not qualified in this report should be considered valid based on the quality control (QC) criteria that have been reviewed.

TABLE 1
SAMPLES THAT HAVE UNDERGONE
A RIGOROUS QUALITY ASSURANCE REVIEW

Geomatrix Consultants Sample Number	Laboratory Sample Number	SDG	Date Sample Collected	Parameter(s) Analyzed
050801114	A1E090157-001	A1E090157	5/08/01	V, SVOA, Pest, PCB, M ¹ , M [*] , OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
050801114S (Matrix Spike)	A1E090157-001	A1E090157	5/08/01	Cl, CN, NH ₄ , NO ₃ /NO ₂ , P, TOC
050801114D (Matrix Spike Duplicate)	A1E090157-001	A1E090157	5/08/01	Cl, CN, NH ₄ , NO ₃ /NO ₂ , P, TOC
050801114DUP (Laboratory Duplicate)	A1E090157-001	A1E090157	5/08/01	TDS, TSS
050801117	A1E090157-002	A1E090157	5/08/01	V, SVOA, Pest, PCB, M ¹ , M [*] , OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
050801117S (Matrix Spike)	EC3LM1CW EC3LM1CX A1E090157-002	A1E090157	5/08/01	Pest PCB M^1 , M^* , NO_3/NO_2
050801117D (Matrix Spike Duplicate)	EC3LM1CV EC3LM1C0 A1E090157-002	A1E090157	5/08/01	Pest PCB M^1 , M^* , NO_3/NO_2
Trip Blank (COC035524)	A1E090157-003	A1E090157	5/08/01	V
050801118	A1E090157-004	A1E090157	5/08/01	V, SVOA, Pest, PCB, M ¹ , M [*] , OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
050801120	A1E090157-005	A1E090157	5/08/01	V, SVOA, Pest, PCB, M ¹ , M [*] , OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS

TABLE 1 (Cont.)

Geomatrix Consultants Sample Number	Laboratory Sample Number	SDG	Date Sample Collected	Parameter(s) Analyzed
Trip Blank (COC035525)	A1E090157-006	A1E090157	5/08/01	V
050801113	A1E090157-007	A1E090157	5/08/01	V, SVOA, Pest, PCB, M ¹ , M ⁴ , OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
Trip Blank (COC035523)	A1E090157-008	A1E090157	5/08/01	V
050801119	A1E090157-009	A1E090157	5/08/01	V*, SVOA*, Pest*, PCB, D/F, M², M³, OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
050801119DUP (Laboratory Duplicate)	A1E090157-009	A1E090157	5/08/01	TDS, TSS
050801116	A1E090157-010	A1E090157	5/08/01	V*, SVOA*, Pest*, PCB, D/F, M², CN, SO ₄
Trip Blank (COC035523)	A1E090157-011	A1E090157	5/08/01	V*
050801115	A1E090157-012	A1E090157	5/08/01	V*, SVOA*, Pest*, PCB, D/F, M², M*, OP, Alk, Cl, CN, FeII, FeIII, NO ₃ /NO ₂ , NH ₄ , P, TDS, TOC, SO ₄ , TSS
050801115S (Matrix Spike)	EC3PT1DV EC3PT1DX EC3PT1D1 A1E090157-012	A1E090157	5/08/01	V* SVOA* D/F FeII, FeIII, OP, Alk
050801115D (Matrix Spike Duplicate)	EC3PT1DW EC3PT1DO EC3PT1D2 A1E090157-012	A1E090157	5/08/01	V* SVOA* D/F FeII, FeIII, OP, Alk

TABLE 1 (Cont.)

Geomatrix Consultants Sample Number	Laboratory Sample Number	SDG	Date Sample Collected	Parameter(s) Analyzed
050801115DUP (Laboratory Duplicate)	A1E090157-012	A1E090157	5/08/01	Alk
Trip Blank (COC035534)	A1E090157-013	A1E090157	5/08/01	V*

NOTES:

V - TCL Volatile Organic Compounds by SW-846 Method 8260B.

V* - Appendix IX Volatile Organic Compounds by SW-846 Method 8260B.

SVOA - TCL Semivolatile Organic Compounds by SW-846 Method 8270C.

SVOA*- Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C.

Pest - TCL Organochlorine Pesticides by SW-846 Method 8081A.

Pest* - Appendix IX Organochlorine Pesticides by SW-846 Method 8081A.

PCBs - PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242,

Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082.

D/F - 2,3,7,8-Tetrachlorodibenzo-p-dioxin and select total dioxins and furans by SW-846

Method 8280A.

M¹ - Total TAL Metals by SW-846 Methods 6010B and 7470A.

M² - Select Total Metals (specifically, TAL Metals including tin and minus manganese

and aluminum) by SW-846 Methods 6010B and 7470A.

M* - Dissolved Metals (specifically, calcium, iron, potassium, magnesium, and sodium)

by SW-846 Method 6010B.

OP - Phosphorus as orthophosphate by EPA Method 365.2.

Alk - Bicarbonate alkalinity, carbonate alkalinity, and total alkalinity by EPA Method

310.1.

Cl - Chloride by EPA Method 300.0A.

CN - Total cyanide by SW-846 Method 9012A.

FeIII - Ferric Iron by Standard Methods for the Evaluation of Water and Waste, 18th

Edition Method 3500-FE D.

FeII - Ferrous Iron by Standard Methods for the Evaluation of Water and Waste, 18th

Edition Method 3500-FE D.

NO₃/NO₂ - Nitrate-Nitrite by EPA Method 353.2.

NH₄ - Nitrogen as ammonia by EPA Method 350.3.

P - Total phosphorus by EPA Method 365.2.

TDS - Total dissolved solids by EPA Method 160.1.

TOC - Total organic carbon by EPA Method 415.1.

SO₄ - Total sulfide by EPA Method 376.1.

TSS - Total Suspended Solids by EPA Method 160.2.

Section 1 Quality Assurance Review

A. Organic Data

The organic analyses of 17 aqueous samples (including QC samples) were performed by Severn Trent Laboratories, Inc. of North Canton, Ohio (STL-Ohio). Eight samples were analyzed for TCL volatile organic compounds by SW-846 Method 8260B; six samples (including QC samples) were analyzed for Appendix IX Volatile Organic Compounds by SW-846 Method 8260B; five samples were analyzed for TCL Semivolatile Organic Compounds by SW-846 Method 8270C; five samples (including QC samples) were analyzed for Appendix IX Semivolatile Organic Compounds by SW-846 Method 8270C; seven samples (including QC samples) were analyzed for TCL Organochlorine Pesticides by SW-846 Method 8081A; three samples were analyzed for Appendix IX Organochlorine Pesticides by SW-846 Method 8081A; and nine samples (including QC samples) were analyzed for PCBs (specifically, Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260) by SW-846 Method 8082. In addition to the analyses performed by STL-Ohio, five samples were analyzed for 2,3,7,8-tetrachlorodibenzo-p-dioxin; total tetrachlorodibenzo-p-dioxins (TCDD); total pentachlorodibenzo-p-dioxins (PeCDD); total hexachlorodibenzo-p-dioxins (HxCDD); total tetrachlorodibenzo-p-furans (TCDF); total pentachlorodibenzo-p-furans (PeCDF); and total hexachlorodibenzo-p-furans (HxCDF) by the STL facility in West Sacramento, California. These analyses are specified on Table 1 and the analytical results are summarized in Section 2 of this report.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, system monitoring compound recoveries, matrix spike/matrix spike duplicate (MS/MSD) analysis accuracy and precision, laboratory control sample (LCS) recoveries, initial and continuing calibrations, target compound matching quality, analytical sequence, retention times (RTs), gas chromatography/mass spectroscopy (GC/MS) tuning and mass calibration, internal standard performance, quantitation of positive results, and overall system performance.

A few deficiencies were identified as detailed below. The Environmental Standards, Inc. (Environmental Standards) data reviewer has edited the laboratory-reported data and QC summary forms based on the deficiencies and comments listed in this QA review. Furthermore, the Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Organic Data Support Documentation (Section 3) of this review. The following deficiencies and comments do not necessarily affect data usability. Usability is addressed in the subsequent Organic Data Qualifiers section.

Correctable Deficiencies

- 1. For the volatile fraction, the laboratory reported the initial calibration date and time on the Initial Calibration Data forms and the associated Continuing Calibration Compounds forms as "08-JAN-20001 11:39." According to the associated Volatile Organic GC/MS Tuning and Mass Calibration BFB (Form V), the initial calibration date/time for the volatile initial calibration is 4/12/01 at 11:17.
- 2. For the volatile fraction, the laboratory did not report a positive result for 4-methyl-2-pentanone on the results summary (Form I) for sample 050801120. In addition, the laboratory did not report positive results for acetone on the associated Form I's for samples 050801114 and 050801119. According to the raw data, 4-methyl-2-pentanone was detected in sample 050801120 and acetone was detected in samples 050801114 and 050801119. These positive results were added to the data summary tables in Section 2 of this quality assurance review.
- 3. For the semivolatile fraction, the laboratory did not report a positive result for benzo(g,h,i)perylene on the Form I for sample 050801117. In addition, the laboratory did not report positive results for dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene in sample 050801120; for 1,3-dichlorobenzene in sample 05080113, and for bis(2-ethylhexyl)phthalate in sample 050801116. According to the raw data, benzo(g,h,i)perylene was detected in sample 050801117, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene were detected in sample 050801120, 1,3-dichlorobenzene was detected in sample 050801113, and bis(2-ethylhexyl)phthalate was detected in sample 050801116. These positive results were added to the data summary tables in Section 2 of this quality assurance review.
- 4. For the semivolatile fraction, the laboratory did not apply an alternate initial calibration option (i.e., linear or quadratic) for the target compound famphur. The relative standard deviation (%RSD) of the relative response factors (RRFs) in the initial calibration for this compound was greater than 15%. According to SW-846 Method 8270C (Section 7.3.7.1), alternate calibration options must be applied for any compound with a %RSD greater than 15%. Qualification of data due to this issue was not warranted because positive results for famphur were not observed in the associated samples.
- 5. For the pesticide fraction, the reported initial calibration dates and times on the Initial Calibration Data forms and the associated Continuing Calibration Compounds forms did not correspond to the calibration dates and times reported on the associated Pesticide Analytical Sequence summaries (Form VIIIs) or the raw data.

- 6. For the pesticide fraction, the laboratory reported the initial calibration date on the Form VIIIs associated with the samples analyzed on 5/12/01 and 5/18/01 as "03/24/01." According to the raw data, the initial calibration date is 5/12/01.
- 7. For the pesticide fraction, the laboratory did not perform alternate calibration for the compound chlorobenzilate, which exhibited a %RSD greater than 20% in the associated initial calibration. According to SW-856 Method 8081A (Section 7.4.5.3), if the RSD of the calibration factor is greater than 20%, the analyst must use a calibration curve or a non-linear calibration model for quantitation. Chlorobenzilate was not detected in the project samples; therefore, qualification of data was not warranted.
- 8. For the pesticide fraction, the laboratory consistently reported the lower results from the results obtained from the two chromatographic columns used for analysis. According to SW-846 Method 8000 (Section 7.10.4.2), if the relative percent difference (RPD) between the results obtained from separate chromatographic columns is greater than 40% and there is no evidence of chromatographic problems, the higher result should be reported. The table below lists a comparison of the positive results obtained from the two chromatographic columns used for analysis. Qualification of data due to this issue is addressed in the Organic Data Qualifiers section.

<u>Sample</u>	<u>Compound</u>	Reported <u>Result (µg/L)</u>	Alternate Column Result (µg/L)	<u>RPD</u>
050801120	aldri n	0.42	0.49	15%
	delta-BHC	0.11	0.17	43%
	dieldrin	0.054	0.45	158%
	endrin	0.043	0.044	2%
	heptachl or	0.10	0.25	79 %
050801113	dieldrin	0.11	0.19	53%
	endosulfan II	0.13	0.18	32%
050801119	endrin aldehyde	0.35	0.61	51%
050801115	dieldrin	0.19	0.19	0%
	endosulfan II	0.13	0.19	38%

9. For the pesticide fraction, the laboratory reported a positive result for endosulfan I and a "not-detected" result for dieldrin in sample 050801115. The raw data indicate a "not-detected" result for endosulfan I and a positive result for dieldrin in this sample. The positive result for dieldrin and the "not-detected" result for endosulfan I were added to the data summary tables presented in Section 2 of this quality assurance review.

- 10. For the PCB fraction, the laboratory reported the initial calibration start date and time on the Initial Calibration Data forms for the initial calibration analyzed on 5/02/01 and the associated Continuing Calibration Compounds forms as "12-AUG-2000 01:28." According to the raw data, the initial calibration start date/time is 5/02/01 at 15:00.
- 11. The laboratory reported an incorrect date of analysis on the Method Blank Report, the Laboratory Control Sample Data Report, and the Laboratory Control Sample Evaluation Report for the dioxins and furans analysis. These summary forms indicate that the method blank and laboratory control sample were analyzed on 5/18/01; however, the raw data indicate that these quality control samples were analyzed on 5/17/01.
- 12. The laboratory used an acceptance range of 1.24-1.78 for the mass ratios for 1,2,3,7,8-pentachlorodibenzo-p-dioxin and 1,2,3,7,8-peCDF. According to SW-846 Method 8280A (Table 9), an acceptance range of 1.32-1.78 should be used. The data reviewer reviewed all mass ratios and determined that all ratios were within method criteria.
- 13. The laboratory analyzed closing calibration standards as part of the dioxin and furan analytical sequence, but the results of these continuing calibrations were not summarized on quality control forms. The data reviewer summarized the results of the closing calibration standards on Microsoft Excel spreadsheets and used these results to qualify data if necessary.
- 14. The laboratory analyzed a second-source calibration check standard after the initial calibration of the GC/MS for the dioxin and furan analyses. The laboratory used an incorrect relative response factor (RRF) for the quantitation of the result for 1,2,3,4,7,8-HxCDD in the calibration check standard; consequently, the reported percent difference (%D) for the compound was incorrect. The data reviewer recalculated the RRF and %D for the compound using the correct RRF. The %D for the compound was within the acceptance range for the analysis (i.e., <30%).
- 15. For the second-source standard analyzed after the initial calibration for the dioxin and furan analyses, the laboratory used an incorrect peak area for the quantitation of the RRF for the labeled compound C₁₃-1,2,3,6,7,8-HxCDD. The peak integrated for the calculation had an RT of 36.403 minutes; however, this peak area was also used for the calculation of the RRF for C₁₃-1,2,3,7,8,9-HxCDD. A review of the RTs for the two labeled compounds revealed that this peak was actually C₁₃-1,2,3,7,8,9-HxCDD, and the peak for C₁₃-1,2,3,6,7,8-HxCDD had an RT of approximately 36.120 minutes. The acceptability of the RRF for C₁₃-1,2,3,6,7,8-HxCDD in the second-source standard could not be evaluated.

Noncorrectable Deficiencies

- 1. For the volatile fraction, the Case Narrative stated that the pH of sample 050801120 was greater than 2. According to SW-846 Chapter 4 (Table 4-1), volatile organic analysis samples must be preserved to a pH ≤2. Sample 05081120 was analyzed within 7 days of sample collection; therefore, qualification of data due to this issue is not warranted.
- 2. For the pesticide fraction, the laboratory analyzed samples after invalid calibration verifications (*i.e.*, percent difference and/or percent drifts > 15%) analyzed on 5/13/01 at 02:33, on 5/18/01 at 12:16, and on 5/18/01 at 12:37. According to SW-846 Method 8081A (Section 7.5.2.3), if the response for an analyte is not within ±15%, a new initial calibration must be prepared. Qualification of data due to this issue is addressed in the Organic Data Qualifiers section.

Comments

- 1. For the volatile fraction, sample 050801118 was analyzed at a five-fold dilution, sample 050801120 was analyzed at a 500-fold dilution, sample 050801113 was analyzed at a 50-fold dilution, sample 050801119 was analyzed at a two and one half-fold dilution, and sample 050801115 was analyzed at a two-fold dilution due to high concentrations of target compounds. The quantitation limits for these samples were raised accordingly.
- 2. According to Method 8260B (Section 7.4.7) and Method 8270C (Section 7.4.6), the laboratory is required to compare the internal standard area counts and RTs in the continuing check standard against those in the mid-point standard of the initial calibration. The laboratory did not provide documentation that this check had been performed. The data reviewer compared the internal standard area counts and RTs between the initial and continuing calibration standards. All RTs for the internal standards in the continuing calibration standard were within the method-specified QC range of ±30 seconds from the RTs in the initial calibration standard, and the area counts for the internal standards in the continuing calibration standard were within the limits of -50% to +100% of the area counts of the initial calibration standard.
- 3. For the volatile fraction, the laboratory did not report all of the target compounds on the LCS, MS, and MSD QC summary forms and on the associated Form I's. Upon Environmental Standards' inquiry, the laboratory responded that all compounds in the spiking solution could not be reported on the aforementioned LCS, MS, and MSD QC summary forms due to software limitations.

- 4. For the semivolatile fraction, sample 050801120 was analyzed at a 50-fold dilution, sample 050801119 was analyzed at a two and one half-fold dilution, and sample 050801115 was analyzed at a 10-fold dilution due to high levels of tentatively identified compounds (TICs) in these samples. Sample 050801113 was analyzed at a 12.5-fold due to high concentrations of target compounds. The quantitation limits for these samples were raised accordingly.
- 5. For the semivolatile fraction, the laboratory reported the compound 2,2'-oxybis(1-chloropropane) on the Form I's and as bis(2-chloroisopropyl)ether on the Initial Calibration Data and Continuing Calibration Compounds summaries. The data reviewer reported this compound on the data summary tables as reported on the Form I's.
- 6. For the semivolatile fraction, all target compounds were not in the spiking standard for the associated LCS; consequently, the data reviewer could not evaluate laboratory performance separately from matrix effects for the compounds not included in the LCS.
- 7. For the semivolatile fraction, the laboratory did not provide the extraction logs for samples 050801113, 050801114, 050801117, 050801118, and 050801120 in the data package provided for review. Upon Environmental Standards' request, the laboratory provided these data.
- 8. For the pesticide fraction, a number of deliverables related to the initial calibrations and RT windows were not included in the data package provided for review. Upon Environmental Standards' request, the laboratory provided these data. Copies of the requested information are presented in Project Correspondence (Section 6) of this quality assurance review.
- 9. For the pesticide fraction, samples 050801113 and 050801115 were analyzed at five-fold dilutions, and sample 050801119 was analyzed at a 10-fold dilution due to matrix interferences in these samples. The quantitation limits for these samples were raised accordingly.
- 10. For the PCB fraction, sample 050801119 was analyzed at a 10-fold dilution due to matrix interference. The quantitation limits for this sample were raised accordingly.
- 11. For the PCB fraction, the laboratory quantitated the continuing calibration standards analyzed on 5/13/01 at 19:51 and on 5/14/01 at 09:01 and at 13:30 on instrument HP2 using method file HP2PCBF.m. The associated initial calibration was updated to method file HP2PCBR.m. Upon Environmental Standards' request, the laboratory requantitated the aforementioned continuing calibration standards and regenerated the associated forms.
- 12. As stated in the Case Narrative, the dioxin and furan analyses were performed by STL's West Sacramento, California, facility.

13. The field sampling team submitted several trip blanks to the laboratory for volatile organic analysis. All of these field quality control samples were labeled identically ("Trip Blank"). The data reviewer has used the Chain-of-Custody record numbers to differentiate the trip blanks in this report and on the data summary tables in Section 2 of this QA review.

With respect to data usability, the principal areas of concern are calibration issues, low LCS recoveries, low matrix spike/matrix spike duplicate recoveries, high surrogate compound recoveries, imprecision of results reported from two separate chromatographic columns, and reported results less than the quantitation limit. Based on a rigorous review of the data provided, the following organic data qualifiers are offered. The following organic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Organic Data Qualifiers

- Although not qualified due to blank contamination, the positive results for methylene chloride in sample 05080114, for acetone in samples 050801114 and 050801119, and for bis(2-ethylexyl)phthalate in sample 05081116 should be used with caution. These compounds are common laboratory contaminants and were detected in the samples at low concentrations.
- The analyses for acrolein, acetonitrile, propionitrile, and isobutanol in samples 050801115, 050801116, 050801119, TB (COC035534), and TB (COC035535) should be considered unreliable, and the "not-detected" results for these compounds in the aforementioned samples have been flagged "R" on the data summary tables. Very low RRFs (< 0.05) were reported for these compounds in the associated initial and/or continuing calibrations.
- The analyses for 4-chloroaniline in samples 050801113, 050801114, 050801117, 050801118, and 050801120 and for hexachlorocyclopentadiene in samples 050801115, 050801116, and 050801119 should be considered unreliable, and the "not-detected" results for these compounds in the aforementioned samples have been flagged "R" on the data summary tables. Very low recoveries (%R<10%) for these compounds were observed in the associated LCS analyses.
- The analysis for acetone in all samples should be considered unreliable, and the "not-detected" results have been flagged "R" on the data summary tables. In addition, the positive results for acetone in all samples should be considered estimated and have been flagged "J" on the data summary tables. A very high %D (>90%) was reported for

acetone in the continuing calibration standard associated with the volatile organics analysis of the project samples.

- The quantitation limits for acrolein and vinyl acetate in samples 050801115, 050801116, 050801119, TB (COC035534), and TB (COC035535) may be higher than reported, and the "not-detected" results for these compounds have been flagged "UJ" on the data summary tables (unless previously flagged "R"). High percent differences or drifts (>20%) in the direction of decreased instrument sensitivity were observed for these compounds in the associated continuing calibration standard analyses.
- The quantitation limits for acetonitrile in samples 050801115, 050801116, 050801119, TB (COC035534), and TB (COC035535) may be higher than reported, and the "not-detected" results for these compounds have been flagged "UJ" on the data summary tables (unless previously flagged "R"). A high %D (>20%) in the direction of increased instrument sensitivity was observed for this compound in the associated continuing calibration standard analysis. The quantitation limits for acetonitrile in the aforementioned samples may be acceptable as reported because the bias was in the direction of increased instrument sensitivity.
- The quantitation limits for bis(2-ethylhexyl)phthalate, hexachlorocyclopentadiene, and famphur in samples 050801115, 050801116, and 050801119 may be higher than reported, and the "not-detected" results for these compounds have been flagged "UJ" on the data summary tables (unless previously flagged "R"). In addition, the reported positive result for bis(2-ethylhexyl)phthalate in sample 050801116 should be considered estimated and has been flagged "J" on the data summary tables. High %Ds (>25%) were observed for these compounds in the associated continuing calibration standard analyses.
- The quantitation limits for styrene in samples 050801114, 050801117, TB (COC035524), 050801118, TB (COC035525), 050801113, TB (COC035523), and 050801120 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data summary tables. A low recovery (<85%) was observed for styrene in the associated LCS analysis.
- The quantitation limits for methylene chloride and vinyl chloride in sample 050801115 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data summary tables. Low recoveries (%R<QC Limits) were observed for these compounds in the associated MS and/or MSD analyses.
- The reported positive results for aniline and 1,2-dichlorobenzene in sample 0050801119 should be considered estimated and have been flagged "J" on the data summary tables. A high recovery (%R>112%) was observed for the base/neutral surrogate compound nitrobenzene-d₅ in this sample.

- The reported positive results for *delta-BHC*, heptachlor, aldrin, and dieldrin in sample 050801120 should be considered estimated and have been flagged "J" on the data summary tables. High differences (>±RL) were observed between the results obtained from the two chromatographic columns used for the analysis of this sample.
- The reported positive results for *delta*-BHC, aldrin, and endrin in sample 050801120 should be considered estimated and have been flagged "J" on the data summary tables. A high recovery (%R>130%) was observed for the surrogate compound tetrachloro-*m*-xylene (TCMX) on the chromatographic column from which the results for *delta*-BHC, aldrin, and endrin were reported in sample 050801120.
- The quantitation limits for the compounds in the following samples may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data tables. High %Ds (>15%), coupled with decreases in instrument sensitivity, were observed for these compounds in the associated continuing calibration standards.

 Compound(s)
 Samples With Biased Low Quantitation Limits ("UJ")

 endrin aldehyde
 050801114, 050801116, 050801117, 050801118, and 050801120

 kepone and chlorobenzilate
 050801116, 050801119, and 050801115

 isodrin and diallate
 050801119 and 050801115

- Per US EPA reporting requirements, all positive results reported at levels less than the quantitation limits (adjusted for dilutions) should be considered estimated and have been flagged "J" on the data tables.

A complete support document of this organic QA review is provided in Section 3 of this report.

B. Inorganic and Wet Chemistry Data

The inorganic analyses of 17 aqueous samples (including QC samples) were performed by Severn Trent Laboratories, Inc. of North Canton, Ohio. Seven samples were analyzed for target analyte list (TAL) metals by SW-846 Methods 6010B and 7470A; three samples were analyzed for select total TAL Metals (specifically, TAL metals including tin and excluding manganese and aluminum) by SW-846 Methods 6010B and 7470A; nine samples were analyzed for dissolved metals (specifically, calcium, iron, potassium, magnesium, and sodium) by SW-846 Method 6010B; nine samples were analyzed for phosphorus as orthophosphate by EPA Method 365.2; ten samples were analyzed for bicarbonate alkalinity, carbonate alkalinity, and total alkalinity by EPA Method 310.1;

w:\geomatrix\rohm haas\dv\y1071626\final\report1.doc



nine samples were analyzed for chloride by EPA Method 300.0A; nine samples were analyzed for total cyanide by SW-846 Method 9012A; nine samples were analyzed for ferric iron and ferrous iron by Standard Method for the Evaluation of Water and Waste, 18th Edition Method 3500-FE D; eleven samples were analyzed for nitrate-nitrite by EPA Method 353.2; nine samples were analyzed for nitrogen as ammonia by EPA Method 350.3; nine samples were analyzed for total phosphorus by EPA Method 365.2; nine samples were analyzed for total dissolved solids by EPA Method 160.1; nine samples were analyzed for total organic carbon by EPA Method 415.1; eight samples were analyzed for total sulfide by EPA Method 376.1; and nine samples were analyzed for total suspended solids by EPA Method 160.2. These analyses are indicated on Table 1 and the analytical results are summarized in Section 2 of this QA review.

The findings offered in this report are based upon a rigorous review of holding times, blank analysis results, laboratory control sample (LCS) recoveries, MS/MSD recoveries and precision, laboratory duplicate precision, contract-required detection limit (CRDL) standard results, initial and continuing calibration checks, inductively coupled plasma (ICP) serial dilution results, ICP interference checks, analytical sequence, quantitation of positive results, and instrument sensitivity and selectivity. The analytical results for the samples are provided as a summary of the data in Section 2 of this QA review.

A few issues were identified as detailed below. The Environmental Standards data reviewer has included copies of all relevant raw data, QC forms, and other documentation needed to support these edits in the Inorganic and General Chemistry Data Support Documentation (Section 4) of this QA review. The following comments do not necessarily affect data usability. Usability is addressed in the subsequent Inorganic and General Chemistry Data Qualifiers section.

Comments

- 1. The laboratory utilized the same QC samples (method blank and LCS) for the total and dissolved metal analyses. The laboratory should have prepared QC samples for each analysis performed. The data reviewer was unable to determine if the QC samples had been filtered.
- 2. The laboratory did not provide summary forms for the CRDL standard analyses. Environmental Standards requested this information, but the laboratory did not provide a summary form or the true concentrations (for ICP analytes); therefore, the CRDL standards for ICP analytes could not be evaluated.
- 3. The laboratory did not record final volumes for the project or QC samples on the Metals Prep Logs; however, final volume information was reported on the Metals Preparation Summary sheet.

- 4. The laboratory analyzed a laboratory duplicate for sample 050801119 but did not report the result on the Sample Duplicate Evaluation Report summary form. The data reviewer was able to evaluate the result from the raw data.
- 5. The laboratory did not include a background analysis for ferrous iron for sample 050801117. According to the Septtrophotometric Logsheet, a background sample had been analyzed for all samples except sample 050801117. The data reviewer was unable to determine why the laboratory did not analyze a background sample.
- 6. The laboratory did not include the raw data for the total phosphorus analyses. Upon Environmental Standards' request, the laboratory provided the missing data (included in Section 6).

With respect to data usability, the principal areas of concern are blank contamination, low matrix spike/matrix spike duplicate recoveries, interferences observed in the ICP analysis of the samples, and large negative instrument responses in calibration blanks. Based on a rigorous review of the data provided, the following inorganics data qualifiers are offered. The following inorganic data usability issues represent an interpretation of the QC results obtained for the project samples. Accordingly, the following data usability issues should not necessarily be construed as an indication of laboratory performance.

Inorganic and General Chemistry Data Qualifiers

- Due to trace-level presence of the following analytes in the associated preparation blanks and calibration blanks, these analytes should be considered "not-detected" in the samples listed below and have been flagged "U" on the data summary tables. It should be noted that dilution factors were taken into account when evaluating blank contamination.

Analyte(s)	Sample(s) With Positive Results Qualified as "Not-Detected" ("U")
cadmium and beryllium	050801114 (Total)
cadmiu m	050801117 (Total)
cadmium, chromium, and barium	050801118 (Total)
aluminu m	050801113 (Total)
cadmium and barium	050801119 (Total)
tin, calcium, and magnesium	050801116 (Total)

w:\geomatrix\rohm haas\dv\y1071626\final\report1.doc

Analyte(s)

chromium, barium, zinc, and iron nitrogen as ammonia nitrate-nitrite

Sample(s) With Positive Results Qualified as "Not-Detected" ("U")

050801115 (Total)

050801114 and 050801117

050801113

- The analyses for carbonate alkalinity in all samples, except sample 050801116, should be considered unusable, and the "not-detected" results have been flagged "R" on the data summary tables. Furthermore, the reported positive results for bicarbonate alkalinity and total alkalinity in all samples, except sample 050801116, should be considered estimated and have been flagged "J" on the data summary tables. Very low recoveries (<30%) were observed for total alkalinity in the associated MS/MSD analyses.
- The analyses for total phosphorus in samples 050801117 and 050801118 should be considered unusable and the "not-detected" results have been flagged "R" on the data summary tables. Furthermore, the reported positive results for total phosphorus in samples 050801114, 050801120, 050801113, 050801119, and 050801115 should be considered estimated and have been flagged "J" on the data summary tables. Very low recoveries (<30%) were observed for total phosphorus in the MS/MSD analyses.
- The detection limits for vanadium in sample 050801117 and for zinc in samples 050801117, 050801118, 050801113, and 050801119 may be higher than reported, and the "not-detected" results have been flagged "UJ" on the data summary tables. Furthermore, the positive results for vanadium in samples 050801118, 050801113, 050801119, and 05080115 and for zinc in sample 050801115 should be considered estimated and have been flagged "J" (unless previously flagged "U") on the data summary tables. High negative responses (with absolute values greater than twice the instrument detection limit [IDL]) were observed in the ICSA/AB standards analysis associated with the project samples, and these samples displayed a high level (greater than 50% of the concentration in the ICSA/AB standard) of one or more of the interference analytes (i.e., calcium, magnesium, iron, or aluminum).
- The detection limits for aluminum in samples 050801117 and 050801120 may be higher than reported, and the "not-detected" results for aluminum have been flagged "UJ" on the data summary tables. In addition, the positive result for aluminum in sample 050801118 should be considered estimated and has been flagged "J" on the data summary tables. High negative responses (with absolute values greater than twice the IDL) were observed for aluminum in the associated method blanks.

The reported positive results for nitrogen as ammonia in samples 050801114, 050801117, 050801118, 050801120, 050801113, 050801119, and 050801115 should be considered estimated and have been flagged "J" (unless previously flagged "U") on the data summary tables. Low recoveries (<75%) were observed for nitrogen as ammonia in the associated MS/MSD analyses.

A complete support documentation for the inorganic and general chemistry data validation is presented in Section 4 of the QA review.

C. Conclusions

This QA review has identified several aspects of the data that required qualification. The analytical data should be considered acceptable for use unless otherwise indicated in the QA review. In order to use any of the data, the data user should understand the qualifications and limitations specified in this QA review. The Project Chain-of-Custody Records and Case Narratives are presented in Section 5. Project Correspondence is presented in Section 6.

Report prepared by:

Glenn S. Esler

Quality Assurance Chemist

Report reviewed by:

Donald J. Lancaster, M.S.

Senior Quality Assurance Chemist III

ENVIRONMENTAL STANDARDS, INC.

1140 Valley Forge Road

P.O. Box 810

Valley Forge, PA 19482-0810

(610) 935-5577

Report prepared by:

Gwendolyn M. Hallquist

Quality Assurance Chemist

Report reviewed and approved by:

Kami KOD

Rock J. Vitale, CEAC, CPC

Technical Director of Chemistry/

Principal

Date: 9-25-01